IN THIS ISSUE: Hydroelectric Development in the Orient

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Building trestle with 45-ft poles for stringers

Packing large rock, weight 1½ tons, over frozen river

Building steel penstock leading from tunnel

Excavating inside of sheet piling to bed-rock

THE LAST NEW WEST

The engineer of the West, with a constructive vision that has made possible attainments equalled nowhere else in the world in physical construction, now finds opening before him a vast new panorama, the last new West, consisting of the Pacific with its isles and the countries which line its borders. To take advantage of this new situation, a familiarity with customs of peoples and conditions in climate and natural phenomena hitherto unencountered in engineering practice must be mastered, ever bearing in mind an ideal of service based on the truism that "he profits most who serves best."

JUN 23 1920
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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 44 SAN FRANCISCO, JUNE 15, 1920 Number 12

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Electrical Trade with the Orient

THE dawn of the new decade has brought into the full high-light of world attention the populous lands bordering on the Pacific Ocean. In our own country, there has never been an era in which the Pacific Coast region has played so important a part in framing national and international policies. Typical of the widespread interest throughout the United States in the problems of the Pacific was the holding of the Seventh National Foreign Trade Convention this year in San Francisco—the largest and most representative gathering of its kind yet held.

A growing realization of the important part the Pacific is to play in the destiny of America is everywhere apparent. Recent financial and diplomatic missions, highly gratifying in their results, have gone forth to the Orient—and their full measure of success may be attributed to the character of their personnel, including such men as Frank A. Vanderlip, Thomas W. Lamont and Benjamin Ide Wheeler. This July a special Congressional party is to go out to the Orient to get in touch with the affairs of the Pacific.

Attention is directed particularly to China. The possibilities of future trade between China and America are so vast as scarcely to be guessed at. Our $100,000,000 gained yearly through export sales to China amount to little more than beggar's pence in comparison to the sum which will be aggregated before the century is half over. If we can only sell each human in China an additional 25 cents' worth of goods during the year, we will thereby double our present export trade with that country!

According to the latest available figures, of electrical materials and fittings imported into China, only 20% came from the United States. Surely such a paltry percentage can be bettered by a systematic cultivation of this great trade field. China is beginning to manufacture electrical goods on her own account—especially mazda lamps—but there will always be a magnificent market there for many types of electrical machinery and appliances made in America. That American manufacturers are fully alive to the part they must play in the electrical development of the Orient is indicated by the recent trips across the Pacific of such men as H. M. Herr and L. H. Osborn of the Westinghouse Electric and Manufacturing Company, and A. W. Jones, Manager of the Far Eastern Division, International General Electric Company.

America's share in the expanding prosperity of Pan-Pacific lands is likely to be great. It will be great in proportion to the energy and wisdom displayed by American world traders in the conduct of their sweeping sales campaign.

The Reward for Efficiency

With the exhaustion of our present supply of fuel oil a problem that must be considered for solution in the not distant future in the minds of the engineers is that of getting the most out of the supply of fuel oil while it lasts by increasing the efficiency of oil burning plants to the utmost.

Along these lines the gas industry, which uses 4,800,000 barrels of crude oil per year in California with an approximate increase of 10% each year, is about to conduct a series of practical experiments at Santa Barbara and San Jose with the two most common types of gas generators, to try to find the most efficient gas; that is to find a gas which can be made most economically and at the same time will contain sufficient B.t.u. value per cubic foot to insure the consumer an efficient fuel with the type of burner now used.

During the war England was threatened with a coal shortage, and to conserve this fuel the gas manufacturers produced a gas that was low in heat value but which produced great quantities of benzole and tuolene, both of which were in great demand by the munition works. About twice as much of this low grade gas was produced from a ton of coal as had been done in the pre-war days, and in spite of the reduction of B.t.u. value the gas was found to be only slightly less efficient.

With this in mind these experimental stations will strive to find under what conditions the most gas can be produced from a barrel of oil and an efficiency curve of gases of varying B.t.u. value with the present type of burners. With these two questions settled it will be an easy matter to find the most efficient gas that can be produced from the least oil.

Electrical and mechanical engineers, who in the steam power plants of the West burn over three times as much oil as the gas engineers, should by experiment and constant study strive to increase the efficiency of the steam power plants and help out in this work of conserving one of the greatest of our natural resources, and one which is fast being exhausted. This is the age of efficiency and invention, and there is a great field for the investigation of the efficient handling of an oil burning power plant.

At the recent N. E. L. A. convention at Pasadena Commissioner Edgerton, president of the California Railroad Commission, in no uncertain manner put his stamp of approval on the justice of rewarding public utilities for results in obtaining new economies and putting into practice new inventions that bring about increased efficiencies. Here, then, is the broadest possible endorsement of studies looking to betterments of all kinds in cost of service. The opportunity is a big one, and it is believed the utility companies will not be long in taking full advantage of this broad-visioned policy outlined by this forward-looking regulatory body in the West.

The Insistent Problem in the Orient

Sympathy and courtesy are the two great factors which have more to do with bringing about firm international relations than any other qualities. Three great problems considered from their broad-aspects await solution today in the building up of more friendly relations upon the Pan-Pacific, particularly those relations that have to do with the great island kingdom of Japan. The first is the Japanese problem in California, the second the question of a possible growing suspicion in the minds of Americans as to the aim and purposes of the Japanese nation which in a measure has shaken the confidence of American citizens insofar as activities in Korea, Mongolia, Manchuria, Siberia and Shantung are concerned; and thirdly, the question as to how best to work out an idea of cooperative helpfulness whereby American and Japanese capital may be used to develop China, improve her communications, and accomplish results based upon broad humanitarian motives in which no nation may be the favored nation nor acquire an undue advantage.

Men of the West have followed with profound attention the recent utterances of Frank A. Vanderlip, who has just returned from a most interesting and important informal visit to Japan. We agree with Mr. Vanderlip that whether we like it or not, a fact, and not a theory confronts the nations bordering the Pacific, and that is, that the island kingdom of Japan, in territory not as large as California and having only one-twelfth the arable land, possesses a population of 57,000,000 people, increasing at a rate of 600,000 per annum. We say they are not to immigrate to America, nor should they go and thrust themselves upon their sister nations to their west. Yet the insistent economic urge from within, pressing upon the world without must receive the courteous and sympathetic attention of the entire civilized world. Serious minded and thoughtful men grow tired of the yellow journalistic pleas we hear in certain of the publications of this country and of Japan, which endeavor to stir up unfriendly and unkindly relations with our foreign neighbors. Unquestionably the more thoughtful democracy of both nations yearns for a helpful and cooperative sympathy and courtesy in problems of mutual concern. The entire world is sick at heart, and there is no time for selfishness and narrowness of vision.

Americanism, true and clear-eyed, ever bearing in mind its traditions of the past, views the great world problem not from a selfish viewpoint but rather along the lines of the necessity for an economic reorganization of the entire world that would handle these problems in a large way. If we are to develop friendly international trade relations we must remember that those with whom we trade must have the wherewithal to meet their obligations, or such trade relations cannot exist with permanence. Hence the great modern scheme of economics must be revised to meet a constructive policy that will extend not only sympathy and courtesy in the ideal, but in a practical way offer helpful financial assistance, seeing to it that the great countries of the Pacific upon which dwell over one-half the peoples of the world receive such thoughtful and constructive attention as will make it possible for these peoples to develop with an assured economic destiny.

The Growing Pan-Pacific Trade

All the world knows that our imports and exports have vastly increased between the United States and foreign countries during the last eight-year period. Few, however, appreciate the fact that foreign trade with Pacific Coast points has, in ratio of increase, far outdistanced any other district of the United States. Thus, by reference to the foreign commerce reports of the United States it is found that in 1911 our total imports were practically one and one-half billion dollars, while eight years later, 1919, these imports increased to almost an even three billion dollars, representing a doubling of our import schedule. It is interesting to note, however, that during this same period imports to Pacific Coast ports increased from almost an even one hundred million dollars in 1911 to almost five hundred million dollars in 1919, thus increasing in a ratio of five times that prevailing in 1911.

Again, a consideration of the export situation will be of interest. In 1911, for instance, the total exports of the United States were slightly over two billion dollars, and these increased in 1919 to about seven and a quarter billion dollars, thus increasing at a rate of about three and one-half. Turning once more to the Pacific Coast situation, again an interesting condition prevails, for our exports from these ports in 1911 totaled but ninety-four million dollars, while in 1919 they reached the enormous total of over six hundred and twenty million dollars, thus increasing to an extent of about six and one-half times that of the 1911 period. Such a situation as this shows most emphatically the strategic position

occupied by the great and flourishing ports of the Pacific Coast, and in this flourishing condition electrical ware and electrical apparatus unquestionably, as time goes on, will occupy a more emphatic setting.

Commission Regulation in Canada

A bill was recently passed in British Columbia, to dissolve the public utilities commission. The reasons given in the bill for the dissolution are that as there is a dominion commission, a provincial commission is an unnecessary expense, and since the majority of the public service companies have become dominion companies, they are under the control of the larger commission. This, however, does not apply to the power companies or electric railways.

The history of the public utilities commission of British Columbia shows that it has been a large factor in the development of the electrical industry in that province by allowing the power companies to charge rates that would bring them in a fair return on their investment, and allow them capital enough to carry out an extensive construction campaign. The future of British Columbia depends on the development of its resources in which it is unusually blessed, particularly its water power. These can only be developed if the investor is shown that he will receive a fair return on the money he puts into the development, and be assured that the industry he fosters will not be strangled by unwise or ignorant legislation.

A commission located at Ottawa, twenty-five hundred miles away, cannot possibly appreciate conditions as they exist in British Columbia, and cannot give attention to the little details that assure the public and the companies regulated a fair and impartial judgment—a decision that has been arrived at after hearing the arguments of both sides in person.

Location of Fuel Oil Burners

The fact that one great central station of the West has temporarily abandoned its plan of additional installations of steam electric units due to the increasing cost of fuel oil, emphasizes more than ever the necessity for every central station manager, executive and engineer looking into the problem of how oil may be more economically burned in the furnace.

On another page of this issue will be found the beginning of a series of articles on "Fuel Oil and Steam Engineering" that should be most timely and helpful. As a first aid to efficient and economical operation in the steam power plant generating stations, the furnace arrangement and the location of burners are of prime importance. The simplest form of oil burning furnace has the burners entering through the boiler front, the flame shooting back toward the rear of the furnace. This is the most suitable type of furnace for return tubular boilers or for water tube boilers having horizontal baffles, such as Heine or Parker boilers.

For water tube boilers in which the tubes incline downward toward the rear and having vertical passages, such as the Babcock & Wilcox boiler, a furnace has been developed in which the burner head is placed at the bridge wall, and the flame shoots forward from there. This furnace, which is known as the Peabody furnace, was the result of an extended series of tests made by E. H. Peabody in California some years ago.

With the Stirling boiler excellent results are obtained either with the front burner arrangement or with the burners located at the bridge wall. With the former arrangement the gases come into intimate contact with the boiler heating surface. With the latter arrangement a very large furnace volume is made available so that perfect combination is obtained even at very high capacities, and as the front tubes absorb a large amount of radiant heat, excellent efficiencies are obtained. With a four-pass Stirling boiler and a Peabody furnace, still better results are obtained, for in this type of boiler there are fewer tubes exposed direct to the fire and the gases are guided down upon the remaining tubes after passing the first baffle. This arrangement, therefore, gives a combination of a large combustion chamber and efficient heat absorption.

There are many other arrangements that may be evolved in a study of economic burning of oil in the furnace for steam electric generation, and it should be the special province of each steam power engineer in our various steam electric plants of the West at the present time to give unusual study and emphasis to the search for even more efficient arrangements of burner and furnace than have existed hitherto.

Water Power Bill Fails

The failure of the President to sign the Water Power Bill after it passed Congress is a matter of the most profound regret. As there is no assurance that at the next session Congress will pass this bill of such vital importance to the West, it should rightly be made a political issue in the next election. With the industry united in a campaign to show the voters why the passage of a satisfactory bill has a peculiar interest to each one of them, there is a reasonable certainty that congressional representatives will be elected who will actively press this matter.

Trade and Our Hispanic Traditions

A recent engineering trade review gave particulars of railroad construction between Los Angeles and Santa Barbara. It was only when the reader delved deeper into the article that he noted that it dealt with developments in Chile, not California. "The litany of the saints" is repeated in place-names along the Pacific seaboard of the Americas, from San Francisco all the way to Cape Horn.

In these days of increased friendship and interest between the peoples of the Americas, it is well to recall the Hispanic traditions of our Southwest. Cabrillo, Portola, Galvez, Padre Serra and Coronado are great names in our history. To those Spanish-speaking pioneers is due in no small measure the position our great West holds today.

In casting up our trade balances, we shall no doubt find that such early associations with the "sons of Spain" will count in our favor in dealing with Latin America. "San Francisco" and "Los Angeles," falling in familiar cadence on Latin-American ears, are actual assets in the friendly competition for trade. And "California" is a name to conjure with, the world over.

With the traditions of the West in such full keeping with our foreign neighbors to the south, we may hope to continue in trade relations in ever-increasing ratio, and in this increase all of our great seaports of the Pacific will share. Seattle, Tacoma, Portland, and Vancouver to the north will thus come in for their portion equally with their sister cities to the south.

In passing, it is interesting to note that the Pacific Coast is taking new advantage of trade opportunities with Latin America. A special steamship service has been established between our Pacific ports and Buenos Aires, Montevideo and other Atlantic ports of South America.

Standardization of Electric Appliances

A profound impression has recently been made upon the electrical industry—and this impression has even gone forth to the public at large—by the fact that recently gathered statistics show this year's business in electrical appliances and supplies to amount to the gigantic total of two billion dollars. To thoughtful men there comes with this announcement an added responsibility to the industry and to the public. Standardization of tests, and approval which should be equitable for the little fellow as well as the big fellow in the manufacturing of appliances should be insisted upon before these appliances go out to the public. These tests should bear with them a statement of the ruggedness, efficiency and the the hazard involved, and they should show the specifications under which these various appliances have been manufactured. It is a well known fact that the patent on Michrome wire under the Hoskins patent will expire in 1923. This situation gives an added emphasis to the necessity of, as early as possible, establishing some laboratory of a national character wherein these appliances may be tested and approved so that quality of workmanship will become a companion ideal to service in the industry. This is a subject that such institutions as the California Electrical Cooperative Campaign, the National Electric Light Association, the Jobbers' Association, Central Stations and Manufacturers may well continue to bear in mind, and at an early date strive to get concrete, comprehensive action under way.

Engineering Projects and the Nature Lover

Recent protests have been voiced by both the residents about Lake Tahoe and by various groups of citizens in different parts of California interested in the preservation of natural landmarks, against the use of Lake Tahoe for power purposes. There is no intention of trying the rights of the present case in these columns, that being a matter for determination by the Department of the Interior which granted the permit in the first place, nor is it our province to judge between the relative values of navigation rights and power development, if indeed such comparison be involved. The interesting feature in the discussion is the minor element of protest from nature loving citizens which seems to have been made on general principles without any direct familiarity with the details and conditions of the subject under consideration.

The engineers of the country should be the last to endanger such a national asset as Lake Tahoe, and indeed so far as it appears at the present time, no such danger is threatened, only the overflow waters of the lake being involved. By all means maintain the natural beauties of the country. It might be well to go farther and protest against the establishment of amusement parks and merry-go-rounds against the background of dignity offered by the national parks. But the utilization of water for agricultural and domestic purposes and the development of power to meet the needs of home and industry are commendable projects in themselves. In their elemental necessity they possess a dignity of their own and their mention even in connection with the beauties of nature is not necessarily defiling or destructive. With the increasing density of population, the supplying of water or the providing of illumination for a large city may conceivably become more important to humanity even than the glories of a waterfall. The plea is not for the lessening of the surveillance which guards the remaining natural beauties of the nation, but merely for the substitution of sanity for sentimentality in their preservation.

IN THE NEXT ISSUE —

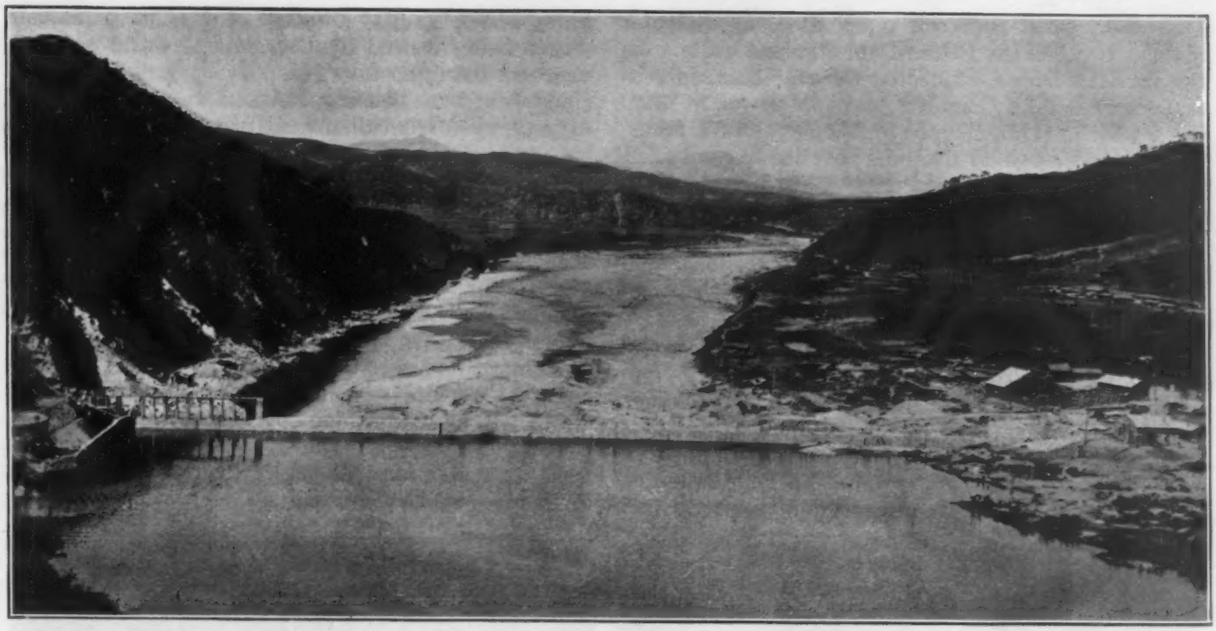
The July 1st number will feature

The A. I. E. E. Convention in Portland

General plans, program and papers

July 21-24

There will also be a review of engineering activities in the West with special reference to the work of technical organizations



Suribong Dam on the Kuron River, northern Korea. The dam is 34 ft. high and 650 long, and forms a lake 4 miles long. The face is built of even courses of cut stone.

Construction of Suribong Power Project in Korea

BY O. W. PETERSON

(Electricity in connection with mining operations is frequently of such importance as to warrant the development of a special hydroelectric project to supply the necessary power. The following interesting account of such a development in Korea, not only gives an idea of the extent of these undertakings, but throws much light on construction practices in the Orient. The author, who is superintendent of construction with the Pacific Gas & Electric Company, had full charge of the designing and carrying out of the construction.—The Editor.)

Although the Koreans have many habits and characteristics in common with their neighbors, the Chinese and Japanese, still they have a distinct language, personality and appearance, indicating a somewhat different origin, or, at least, a very long individual development. Korea is a peninsula extending to the south of the mainland of Manchuria and Siberia, with China across the Yellow Sea to the West and the islands of Japan in the southeast. This little known land, with its outlying islands, has an area of about one hundred thousand square miles, or about two-thirds that of California. The population is estimated at about sixteen million. Korea and California are located between practically the same parallels of north latitude, but the climate of the two places is very different, the winters of north and central Korea being long and cold, while in the south they are more moderate, due to the influence of warmer ocean currents. There is a distinct hot sultry rainy season in the summer months of July and August.

The carrying of most of the materials during construction was done by human packers. These "jiggy men" walk all day with a load of 70 to 100 pounds.

Korea was early recognized as a country rich in mineral resources, particularly in gold. The last Emperor of Korea, some twenty years ago, granted a number of mining concessions to foreigners, the first concession being obtained by an American. This property, located at Unsan in northern Korea, and consisting of an area of about five hundred square miles, was subsequently acquired by the Oriental Consolidated Mining Company, an American corporation. To date this concession has produced over twenty-five million dollars in gold from ore with an average milling value of five to six dollars per ton.

Construction Plans

In 1918 the company found it necessary to secure additional hydroelectric power. The site of the project was on Kuron (Nine Serpents) river, twenty-five miles from the mines and about thirty miles from the South Manchuria Railroad. An overpour masonry diversion dam of heavy gravity type, 650 ft. long and 34 ft. high, with foundations extending 15 ft. below low water level of the river, and a diversion tunnel 12 ft. by 12 ft. in section and 955 ft. long, which cut through a narrow granite ridge around which the river makes a four-mile loop, formed the principal features of this development.

Two short steel penstock pipes 6 ft. in diameter connect two 800-hp. Pelton-Doble turbine units with the tunnel. Direct connected General Electric generators of 600-kw. capacity develop power at 2300 volts, which is transformed to 23,000 volts for transmission over a twenty-five mile pole line to the mines. Twenty-two feet of head was gained by cutting across the neck of the bend, and nineteen to twenty-three feet additional was obtained by the diversion dam, depending on whether or not a collapsible flashboard system four feet high is in place on the crest of the dam.

It took about two months to make surveys and borings for the project, and to secure permits from the Governor-General of Korea and various minor government officials. In the meantime, private lands adjacent to the dam site and power house site were purchased and necessary equipment and buildings were hauled in by boat or packed in by cows and coolies, so that when permission to start was received a large crew was at once put to work.

Baling water out of a pit with swinging boxes. With these boxes, which were used before pumps were obtained, two men could lift one hundred gallons per minute to a height of six feet.

Early stages of the May flood. The water rose five feet higher than shown here, washing out all temporary diversion works and construction plant. The rainfall in Korea is extremely erratic.

Labor and Materials

Japanese-made cement was brought in by bull cart from the South Manchurian railroad line thirty-five miles away, four barrels weighing sixteen hundred pounds being a load. Sand of excellent quality was found in the river bed, likewise some gravel was obtained from the excavation pits. The tunnel dump was crushed to furnish concrete rock, while a quarry, just below the dam, provided granite blocks of all sizes.

Five foreigners who were able to speak Korean, four of them Americans, were obtained from the mines to act as foremen on the construction. Excellent assistance in the making of tools and equipment was given by the electrical and mechanical departments at the mines.

A small number of Korean miners, blacksmiths, carpenters, etc., from the mines acted as leaders and bosses of the coolies, a large number of whom were farmers living within twenty miles of the damsite. Altogether about five hundred Koreans were employed, the base wage being twenty-three cents for a ten-hour day when work started and thirty-five cents at the completion of the project. Skilled workmen at first received thirty-five to forty-five cents a day and later fifty to sixty cents, the increase in wages being caused by the general world-wide advance in living costs. The above prices did not include board or housing. About two hundred and fifty Chinese from Shantung province and Manchuria were employed as stone cutters and masons at forty to fifty cents per day, and were found to be fairly industrious. Under favorable conditions the laborer in Korea has an efficiency of about one-third that of the American laborer.

The newly arrived Westerner is liable to underestimate the value of native methods of work and implements. Very often, however, these are found economical and satisfactory, particularly if there is sufficient working room and ample time. It is usually cheaper to have work done by task or contract in the Orient. There was little opportunity, however, to use this system on this project, because new classes of work, with which the natives were unfamiliar, were continually being started, and the conditions under which work was done were continually changing.

Human Packers

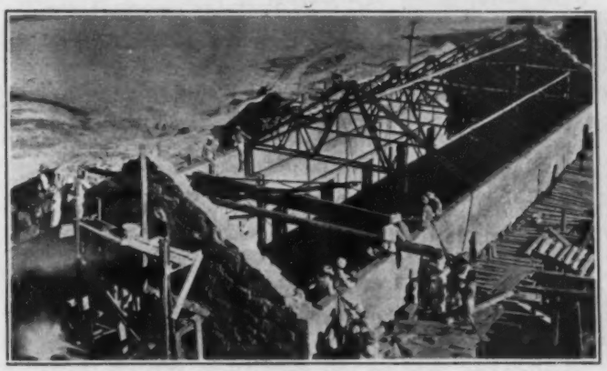
The carrying of boxes of powder, cordwood, etc., on the job was done by human packers who carry their burden on a forked frame strapped to their backs. These "jiggy men," as they are called, walk all day with a load of seventy-five to one hundred pounds. For larger loads of various kinds such as barrels of cement, machinery, timbers, or poles and big rocks, specially trained packers, well named heavy packers, who carry as much as seven hundred pounds per man, were obtained. Two men pack together, walking side by side, with a strong stick about 4 ft. long across their shoulders and necks. Rope slings are used to fasten the load to the carrying stick. The packers walk in perfect unison with rapid mincing steps, chanting as they go. At times eight pairs of packers were used on some big load. Their pay was sixty-two and one-half cents gold per day.

Excavation Work

The first operation in the construction of the dam, started in August of 1918, was the stripping of material above water level. This was done by the basket passers, by men with boxes on their

backs, and with light track and cars. Next followed the excavation of wet sand and gravel with some boulders imbedded. For the east third of the dam, which tied into a high clay bank, this was quite easily done. A trench was first excavated to a depth of about four feet below water level by the use of a long-handled native shovel, which dug to the decomposed granite overlying bed rock. In this wet trench a cofferdam was built of straw bags filled with clay. Crews with swinging boxes were then put to work baling the water from inside the sack levee while other gangs excavated the pit to solid bedrock.

The swinging box or water baler consists of an ordinary wooden box about 8 by 10 in. on the bottom, 10 in. deep and 12 by 14 in. across the top. To the top corners at each end ropes are attached and two men, usually seated, handle these ropes, one in each hand, with arms outstretched, dipping and swinging, back and forth, to the tune of a labor song. Ordinarily one hundred gallons per minute was lifted six feet by two men, and by using a team of four to six men with two or three boxes swinging in tandem, as it were, two hundred to three hundred gallons per minute could be elevated to any height. These boxes were used before pumps were obtained and afterwards for unwatering local depressions in the bedrock. This simple yet ingenious device, like many others used in Korea, is an invention of the Chinese.



The power house building under construction. As floods on the river rise over twenty feet above low river level it was necessary to build masonry walls which would stand water pressure to a height of ten feet above floor line.

Intake structure in front of diversion tunnel. The tunnel is 12 x 12 ft. in section, and 955 ft. long, and is cut through a granite ridge around which the river makes a four-mile loop.

Driving Piles

Farther out in the river, where four to twelve feet of porous sand and gravel with boulders overlying impervious material, sheet piling had to be driven to secure a relatively tight cofferdam. This piling was located thirty feet outside the lines of the dam so as to leave room inside for an undisturbed bank, which, faced with straw bags filled with sand, served as a support for the piling. Some experimenting was done with hand-operated pile drivers, the hammers being raised by fifteen to twenty coolies pulling by four ropes, all to the accompaniment of a labor song. As it was soon found that this method was entirely too slow, a steam operated pile driver was built to handle a 1500-pound hammer. This piece of equipment, like all others used, had to be made on the concession.

On account of the short open season free from flood, construction was continued through the winter. When the temperature dropped lower than 15° F. below zero—the lowest record was 35°—nothing but tunnel work could be done; but on days when the temperature was above 15° F., pile-driving and general construction work was carried on. This was quite remarkable since the Koreans who worked in water were barefooted, it being impossible to obtain rubber boots for them on account of the war embargo on all rubber goods. All who worked in water during very cold weather were given a silver coin, worth five cents, as a bonus at the end of each day's work.

Work Delayed by Floods

At any season of the year in Korea erratic rainfall is liable to occur and cause unexpected floods. Two such occurrences interfered seriously with the progress of construction, one in the early fall and the other in spring. The latter caused the loss of some pumps and engines and washed out several hundred linear feet of sheet piling along with trestles, derricks, etc. As the flood subsided, trestles and diversion works were rebuilt, piling was redriven with two drivers working in three eight-hour shifts, and unwatering of the pit was renewed with a larger pumping unit that could easily handle three thousand gallons of leakage per minute. Every means to rush excavation, concrete, and masonry work was employed, with two eight-hour shifts working from 4 a.m. to 8 p.m. without stop. Men were crowded in as thickly as working space allowed, for the regular summer flood season was due within a month. In this season, the rains amount to as much as 13 in. in twenty-four hours, producing from the 350 square miles of drainage area above Suribong a flood flow of about seventy-five thousand cubic feet per second.

Mixing Concrete by Hand

Since it was most urgent to get the base of the dam built up above water level as quickly as possible so as to reduce pumping expense and the danger of having a flood fill the pit, concrete, which could be placed more rapidly than masonry, was used on that portion of the work. Concrete mixing was done both by hand and machine, until the flood of May,

just mentioned, washed away the only engine available for the operation of the concrete lever. Sand and rock were loaded into empty cement barrels for convenient measurement and movement to the mixing platform. On days when 160 barrels of cement were used a tremendous amount of hand labor was performed. Besides the cement, 960 barrels of rock in lots of six barrels and 480 barrels of sand in lots of three barrels, a total of 1600 barrels weighing over three hundred tons, had to be packed by Korean packers an average distance of fifty feet, besides the necessary water in five-gallon cans. With two mixing gangs at work and one extra gang resting, each consisting of fifty to sixty men, including dumpers of barrels, water tenders, etc., and with one hundred or more packers bringing in barrels of raw material, besides the two hundred or more coolies engaged in filling barrels, there was much human activity. The mixed concrete was loaded into slide-dump cars and transported to the points of use. Large rocks, slung in by derricks and carried in by packers, were imbedded in the concrete up to 20% of the entire mass. In June, 1919, such concrete operations were carried on continuously for three weeks from 4 a.m. to 8 p.m. with two shifts working eight hours without any stops. The mixing was generally done by Chinese, while all the packing and filling of barrels was done by Koreans.

The upstream top face of the dam was built of uncoursed rubble masonry while on the downstream side even courses of cut stone were laid. The downstream edge of the crest was constructed of large stone with face cut to two-foot radius. Rock for the masons was landed on the dam by derricks and heavy packers.

Drilling the Tunnel

The diversion tunnel through the hard granite ridge was driven by hand drilling, on account of the lack of machine drill equipment and of a sufficient number of experienced operators. Three eight-hour shifts, each of which worked straight eight hours without any stop for meals or other causes, except blasting, were organized at each heading. The advance was made by a top heading six feet high and twelve feet wide, a total of about 30 holes, averaging three and one-half feet in depth, being drilled for each round or shooting.

In drilling, six men stood holding 7/8-in. drills in the top portion of the face, while six other Koreans struck with 8-lb. hammers. The holes of the lower half of the top heading were drilled by six men on their knees holding drills four feet longer than usual, which were, in turn, hammered by six other men standing farther back from the face. By this arrangement twelve holes were drilled simultaneously in a heading only six feet high and twelve feet wide, making two men per linear foot of face. The scheme worked excellently, and progress of ninety to one hundred and thirty feet per month was made in each heading in quite hard tight rock, all of which stood without the use of timbers when opened up to full face. The bench, kept as close as possible to the face, was next taken out in two lifts with vertical holes drilled by Korean farmers who were practically experienced in such work. About twenty-five pounds of powder was required per foot of tunnel.

The river was diverted through the tunnel early in Spring, thus removing it from the dam site and lowering the water level several feet around the dam.

The penstock pipes were constructed of plates from light steel tanks formerly in use at the mines. All riveting and caulking was done by hand.

As floods on this river rise over twenty feet above low river level it was necessary to build the power house building with a watertight floor of reinforced concrete, and masonry walls that would stand water pressure to a height of ten feet above the floor line. These walls, extending several feet below floor level to bedrock, are over four feet thick at the base and two feet at the top. A thin reinforced concrete section was built on top of the side walls to make room for the crane and to carry the roof trusses. Machinery foundations and draft tubes were constructed of concrete.

The plant was finally completed in November, 1919, and recent reports tell of its successful operation.

RAILWAY ELECTRIFICATION IN SWITZERLAND

(The current interest in railroad electrification in the West makes the following extract from a letter recently received from Switzerland of especial timely interest.—The Editor.)

The government-operated railways of Switzerland are operated on single phase, 15,000-volt alternating current. This requires the change-over of all low voltage lines in the vicinity of the railroad line to underground construction.

Insulation is tested to 50,000 volts. Both insulators and poles are painted green, so that they may not be too conspicuous.

The locomotives are much heavier than those formerly used, are faster and draw more. They utilize regenerative braking. The drive is by means of a cam which works from both motors connected through a shaft to an idler and thence to two triangles, one on each side, which are heavy discs—otherwise they break too easily. These triangles are then connected with the wheels.

The Gotthard Tunnel was to have been opened in May and the Erstfeld-Bellinzona is scheduled for December, 1920; Zug-Luzern-Chiasso in 1921; and the Basel-Zuerich-Chiasso in 1922. The stretch from Bern to Brieg is already in service.

The canton operated railroads are already two-thirds electrified. They utilize a different drive from that of the federally operated roads.

Work on the Etzel project has been begun this spring. It will cost 90 million francs and furnish power for eastern Switzerland, so that all main lines in this region can be electrified by 1925.

Several projects are now under way. In Wallis, the stream from Mt. Blanc is being developed and is known as the Barberina Project. The canton of Bern is developing Hasli Valley as far as Grimsel, where 300,000 kw. will be obtained for industrial purposes. Work on this is to start this summer.

Reward For Efficiency

BY E. O. EDGERTON

(Constructive thought was the order of the day at the recent Pasadena Convention of the National Electric Light Association, and of the many utterances there made, none stand out more clearly in the public mind, more forcefully, than do those of E. O. Edgerton, president of the California Railroad Commission. He drove home his ideals of utility service and the possibilities of reward in such a clear manner as to give hope and inspiration for the future in matters of finance—both sorely needed in our industry today. The following is from a stenographic report of his address.—The Editor.)

I believe that in a very real sense the gentlemen conducting the public utility business today are public servants. In turning the pages of the report of the Committee on Electrical Resources, I became interested in answers to queries that had been sent out by that committee, these answers coming from California. And one of them particularly struck my attention. I was more interested in that particular answer than in any other, because the gentleman who wrote it evidently felt pretty strongly on the subject of what the Commission had done to him. And to emphasize his objection to what he conceived to be the attitude of the California Railroad Commission, he said, "This Commission must get over the idea that it represents the public." And he quoted "represents the public."

Now, my conception is that it cannot be possible fairly to operate, either on the part of the Utility Commission or on the part of a public utility, except the interests of the public be made paramount.

Let us put the converse of that to see how it would sound—that the best interests of a public utility company lay along the line of working against public interest. Now, none of us would agree to that, I take it. So the opposite must be true. In a very real sense, my eight years on the Railroad Commission teach me that what is good for the public is good for the company, and what is bad for the company is bad for the public. And the Railroad Commission proposes to proceed along that line; and so it says with emphasis that it is to the interests of the consumers and the public that these great institutions be kept sound.

What Is a Reward for Efficiency?

Now, rewards for efficiency. I want to define this subject in my own way. I want to broaden it from a mere discussion of definite specific reward and treat it from the standpoint of inducement to do the best that is in each man who is connected with this great industry, and also finally I want to suggest inducement to the public utility commissioners to do their best.

Let us take money. By the way, for some reason or other that I have not been able to understand—and I have made considerable inquiry on the subject—finance is excluded from public discussion, as an ordinary thing. I looked over your program—and I speak in no sense of criticism—I looked over your program seeking the place where finance would be discussed, and I found nothing. Why that is so I don't understand, because today at least in California—and I think it is true over the nation—the greatest single job that we have is to finance these public utility concerns. And why that great subject should not be pulled frankly out into the open so that the most of intellect and ability can be brought to bear on the subject, I don't understand.

If I dwell too much on California conditions, it is not in any provincial spirit, it is not in any feeling that we in this state dominate the situation in any degree, but it is first because I know California conditions better than any others, and next, because of the situation we are in. The problems perhaps are accentuated out here as compared with the East.

The job of financing these public utilities immediately ahead is a huge one. In California every time I have made an estimate of the amount of money required in the next few years, I have found that somebody raises that estimate. I started in with $250,000,000 in the next ten years, and I have been raised now to $500,000,000; and I don't know where it is going to end.

Charge of Financial Unsoundness

The other day in Chicago a very famous banker was on the witness stand before the Public Utility Commission of that state, and he made this statement, published largely over the nation, that anybody who invested in public utility stock needed a guardian. I don't admit that the electric public utilities of California are financially sound, basically sound. I affirmatively assert, I insist that it is true, and I say that that statement as a generalization is unsound, and as a particularization as applied to California is particularly unsound, and that sort of statement has the effect of offsetting, in some degree at least, the efforts that are being made to build up the credits of these companies in order that the investors may have confidence and assurance. A gentleman of prominence who goes publicly on the witness stand and makes a statement of that kind ought at least to be careful that by a glittering generality he does not do serious damage, probably not intended by him.

I am one of those who believe that you cannot produce the best that is in men and women by punishment. You cannot whip a man into efficiency. In that belief I am convinced you must proceed by inducement; that every one of us in some degree, in order that he may do the best that is in him, requires that before his eyes there be some reward in some form.

Encouraging Western Investment

Let us apply that to the fellow who has money to invest. I recognize that we cannot get money out here from the East into California by threat, by argument, by any form of punishment, by any suggestion that because of investment already made

they cannot quit; I recognize that the money must come by inducement; and in my judgment it can be induced without paying exorbitant and unreasonable prices for it. We must bid for it, yes; but bid for it against speculative securities, against anything anybody is willing to offer—bid for it against the man who offers a chance for large reward? No; I say not. But I believe that we have assets in California which, if properly used, will produce the fundamentals of inducement to investors, this being absolute security of the investment itself, the assurance that the dollar will not become 90 cents or something less, coupled with the certainty and regularity of return. And if we have these assets, why not make use of them, and then if money is available on any terms, we will get that money.

What are these assets? Power houses and transmission lines? Surely. But over and above that we have the assets of a great vital, essential service—a service which the people must have, a service which they cannot get along without. And that is an assurance to an investor that that asset cannot disappear. My judgment is that the Railroad Commission has that asset in trust for the people, and I think they can make bitter complaint if we do not use that asset, coupled with others, so as to produce the necessary money to do the absolutely essential development that must go forward in this state.

Insuring Investment

If it is necessary now to insure investment, to insure regularity and certainty of return, why not face that fact? Why continue to indulge in discussions of technical methods of valuation never settled? Eight years' experience now in the Railroad Commission, with constant discussion of the methods of valuation and proper rate bases and readings of the decisions of the courts, puts me in position to say to you gentlemen that those questions are no more certainly settled today than they were eight years ago. Why not face that as a fact, and why not seek some other method of determining the rate of return the company should get? To face the situation clearly and conscientiously, what methods now shall we pursue?

Sound Capitalization

The sound thing to do is to start with sound capitalization—an admitted, agreed, established capitalization; and thereafter fix rates based on getting the necessary bond interest, dividends, and fixed charges to support that investment, and then to meet the contention of the investor that perhaps later a different policy may be adopted, set up a cash reserve out of rates, to be rigidly held, for the purpose of insuring bond interest and dividends, so that when you go to market your securities in the money markets of the country, the investor can be shown an actual cash reserve as an insurance policy for his bond interest and principal. I realize that this suggestion means almost a complete reversal of the attitude of regulating bodies towards this question. But why not? If it is the sound thing to do, why not reverse the attitude?

I make these suggestions in no spirit of finality. If there is one thing I have learned, it is that final opinions are never final. But I do make them for the purpose of starting discussion on this important subject. If those suggestions are not sound, weaknesses may be pointed out, and I for one will welcome such suggestions. I welcome criticism of regulation in California, only providing that the fellow who criticizes me accords to me the same thing that I accord to him, and that is sincerity of purpose.

Degrees of Efficiency

Are all the electric public utilities at the highest point of efficiency? Well, they are not all here, so we can say they are not, and I think we can conclude that there are different degrees of efficiency among the companies. It is sound to suggest that inducements definitely be held up to the companies to become thoroughly efficient. I think it would pay the public to hold up definite rewards to that end. And incidentally that suggestion has been made quite frequently to our Commission and others. There is a feeling that regulation has a tendency to hold the return down to a dead level, that the inefficient company enjoys that rate of return and that the efficient company enjoys it no more, no less, and that its initiative in a sense is destroyed. Why work, toil, think, to produce efficiency if the regulating body immediately grabs it off in rates? A very fair suggestion. But this is to be thought of: Whom must you reward to get the efficiency?

If you have taken care of the investor, if you have produced a situation where his investment is safe and intact, his return is regular and sure, must you stimulate him to make him efficient? That is not quite what we are thinking of. Then who is it that we should stimulate by offer of reward? In my judgment, it is the organization of the company itself, and when I say "organization" I mean from the president to the office boy. I don't believe it produces efficiency merely to hand the management, as such, the reward; in fact, I am inclined to think that that would produce the opposite effect, because down through the organization would go the feeling that the reward earned by each individual's efforts was going to some one else, and there is not anything in the American mind that produces more resentment than such a situation.

The regulating body ought to give definite assurance that for increased efficiency and economy, always coupled with good service, a reward should be accorded by the regulating body representing the people. The job thereafter is distinctly one of management to make that effective. A management to make it effective must see to it in some efficient way that every member of the organization, no matter how humble, is made to understand in a convincing way that his increased efforts towards efficiency and economy will be rewarded. I speak not only in a money sense, but also of recognition of service well performed by men lower in the ranks; I speak of certainty of advancement when opportunity comes; I speak of the absolute elimination of pull or influence in the advancement in the organization; I speak

of a situation where the management itself studies its personnel and constantly works at the problem, to know what its personnel really is, to know when efficiency and economy are being striven for by the individual in the ranks, and then with absolute certainty to reward that effort on the part of the members of the organization. Is this being done? It is not. As to some of you, yes; but still again they are not all here, so they are not all doing it.

I have had clerks telephone me from the inside of public utility organizations, fearful to give their names to me, to urge that the entire class represented by the speaker over the telephone had been overlooked in the wage increase, and that the wage increase had been given in large part to the organized employes. And in that clerk's heart was the sense that because of the organization, because of the threat held up to the management, additional wages had been accorded and merit had been forgotten. And there is not a more dangerous mental condition in the human mind than to feel that the only possibility of getting a reward is to swing a club.

Solving the Labor Problem

There is no better way to solve the question often called the labor question—there is no better way to take the body of labor, working people, clerks, away from the demagogue leader of the union than to accord every individual in an organization rewards for efficiency. It is the best safeguard against the chap who comes about preaching anarchy, preaching this proposition, "You are not getting a square deal." What better safeguard could there be than to have in the heart of the fellow he comes to, the knowledge that he is getting a square deal? That is better in my judgment, than any panacea that has been suggested; but it requires work and study, and I am not prepared to suggest definite methods of carrying this into effect. I believe it requires, on the part of the management, work, thought, study, effort. Is it worth that effort?

I remember talking to one of the directors of a company that is generally considered—and I think properly so—one of the most efficient in the United States in the matter of organization. It is generally understood that the employes of that company seldom quit. I began to be interested to know why, and so I talked to one of the directors. In a few words he explained the system. He said: "It is the job of the highest officers in our company, it is their principal job, to study, to watch, to investigate, to come in contact with, all of the employes of the company. A rigid rule is adopted that promotions are made upon merit, that in no instance is an outside man called into the organization, except the organization itself has not one of the special knowledge required at the moment; that men starting with the company have an assurance of a career for life, and that they have the assurance that they will be constantly promoted as opportunity offers." I said to him, "Well, if this is the job of the principal officers of the company, how do you find time for the ordinary business of the concern?" He said, "If our organization is efficient, the business takes care of itself. In other words, we sharpen the tool, and we have the confidence thereafter that it will cut. We don't have to worry."

The Railroad Commission

The Railroad Commission also requires efficiency. We are the same kind of animals as you fellows—no different. The job is a little different—true; but in a real sense we are wrapped up in your success, will suffer by your failure. Remember, if the private ownership and operation of public utilities goes down in failure, regulation goes down with it. No matter whether the Commissioners can point the finger of blame to the utility men, if the wreck occurs, regulation has failed.

So you fellows owe a duty to the public utility commissions. You should hold up the reward for efficiency on their part. And the only reward that you have available is to make regulation as little necessary as possible, that you yourselves really put into effect the things outlined by Mr. Kennedy in his very able paper. Beat the regulating body to it, and you will do the best thing you can for the regulating body. By the success of your own efforts in satisfying the public will you make the job of the utility commission a job worth having.

It is a cheap and easy thing, and sometimes results in temporary glory, for commissioners to denounce public utilities; but it is in reality a very costly thing, for the companies and for the commissioners, because finally a denunciation goes to the point of wreck, as I said, and regulation and commissioners go down with the wreck.

Necessity of Hydroelectric Development

And finally, may I say this from the standpoint of California? There is a tremendous job ahead—a job for the electric utilities, a job which involves not only carrying forward the business which naturally accumulates, which normally increases, but the unquestioned job of taking over the work now being done by oil out here. There is not another substitute in sight for oil except hydroelectric energy; and it is a sobering thought to think of the tremendous responsibility which that will place upon the electric utility men of this state and the Commission with them. When you stop to think of a state like California, with agriculture, industry, and the people absolutely dependent upon the efforts of you gentlemen to produce service, think of the responsibility that you not only ought to take upon your shoulders, but that you will have to take upon your shoulders.

Value of Frank Discussion

Realizing that, I make this suggestion, that it is the wise thing to approach this whole problem with an open mind, without any fear whatever of disclosing secrets, withholding information, striving for advantage, this company against the other, in order to solve the problem in a way that will be sound, considering the whole power situation. I believe the proper position for both the companies and the Commission to take is that it is one great problem, and that it is not sound operation on the part of the companies to allow one company to be seri-

ously injured, because that injures the industry as a whole.

I am not suggesting this, but why not discuss it? If today this great job be to get it financed—if to produce the service under the conditions that must be accorded the people, it is necessary to consider complete unification of these plants, why not discuss it? I say the man who is afraid openly and frankly to discuss that subject is fearful it may succeed. Why will the fellow who believes that there is an inherent fundamental weakness in unification not come forward and discuss it with anybody, in the conviction that he can defeat the suggestion?

I only suggest that because I know it touches the heart of the fellow who has built up a company, who has been with it in fair weather and foul, and has a pride in that company, in its giving service and in its entity. I know that, being a human being, he does not like to merge that company with another. I know that he feels he is giving good service, and he is reluctant to consider the unification with other companies that he thinks are below him in the standard of service.

But why not discuss it? If it is the answer, then I say the personal feelings of each of us must go by the board. The great thing to accomplish is the doing of the job, and finally the public will hold us responsible for having the job done. They do not understand all the angles of it. The public of California today, if you suddenly said, "Let us put all the companies together under one great organization," might rebel, because they would not understand what it meant; but that does not exclude us from going forward with the discussion to see whether it is sound. It won't do for us later to say, "Well, you don't want us to do it." My conception finally is that the electric public utility men, with the utility commission, are in responsible charge of doing the job. We must do it efficiently, and then we are entitled to our rewards. If we don't do it, we ought gracefully to take what undoubtedly will result.

Service of the Business Press to Foreign Trade

BY JAMES H. McGRAW

(In the Pan-Pacific field the question of international relations and their effect upon trade and national prosperity is of ever-increasing importance to the electrical industry. The vital part which the business press plays in the establishment and development of healthy international relations is here analyzed by the President of the McGraw-Hill Co., Inc., in excerpts from an address delivered before the recent Foreign Trade Convention.—The Editor.)

Foreign trade to hundreds of manufacturers in this country has been a name only. It is trite to say that the average American manufacturer has thought only in terms of his domestic business for so long that it is usually the exception, rather than the rule, for him to be thoroughly familiar with his opportunities and his responsibilities with regard to foreign trade.

Molding Public Opinion for Foreign Trade

The development of a better understanding of our foreign trade needs and our foreign trade responsibilities is an educational movement, and through the medium of the business press the manufacturers may learn in detail in their several industries something of the opportunities for trade extension in their particular fields.

There are two broad classes of business journals in this country which are functioning to help meet this great problem. First, there are those journals published in this country whose circulation is primarily in the United States. It is the function of these journals to take up the problems of the American manufacturer as an exporter of goods in connection with the other problems that they present to him, and this large group of business papers can do much to arouse the manufacturer to his opportunities in the foreign field.

Then there is a large group of journals which are published in this country, but are presented from the viewpoint of the foreign buyer and the importer in other countries, whose circulation is found in the countries outside of the United States. These papers are printed in different languages, and concern themselves fundamentally with the problems of the buyer of American goods, rather than with the problems of the seller of American goods.

Three Functions of the Business Press in Reference to Foreign Trade

There are three directions in which the business press can function in reference to foreign trade. It can

1. Assist in awakening the business man to the effect of foreign trade as a stabilizer, and of its necessity as an outlet for indefinite increase of our industrial production;
2. Gather and publish information regarding the conditions in foreign lands which affect our trade opportunities; and
3. Spread the knowledge of American goods in foreign lands.

The need for exercising the first of these functions—the awakening of the business man to the stabilizing effect of foreign trade and of its necessity as an absorbent of surplus production—is still one of very great importance indeed. It has been the theme of many a paper before foreign trade gatherings. Nor is it necessary to emphasize again the reason why the business press has a special mission in this regard. That has been amply developed in the introductory remarks to this paper.

It is pertinent to point out, though, that foreign trade will never become the factor it should be in the commercial life of this country until there is a "mass movement" into export trade. This must be preceded by an understanding of its importance, and then accomplished by intelligent cooperative effort. The relatively small corporations, as well as the few dominant ones in each industry, must sell goods abroad. The mass movement should receive its greatest stim-

ulant through the sort of educational work for which the business press is particularly fitted. Even a business paper with as small a subscription list as 5,000 reaches far beyond the confines of the dominant corporations in its industry and is in a position to preach the doctrine of foreign trade to every organization with strength enough to engage successfully in export work.

International Sympathies

Nor is educational effort along the lines of the effect and advantages of foreign trade alone sufficient to bring about the result we desire. It is necessary to awaken international sympathies and to create international thinking in all lines of business. We must break down the insular barriers in both our thinking and our action. They will not fall easily, but only after constant hammering and bringing to bear every resource of fact and logic.

Moreover, while we are working toward the desired goal, the business press can do yeoman service in bringing heavy influence to bear on specific issues. For example, when the Appropriations Committee of the House of Representatives in February cut the appropriations for our foreign trade promotion work, the business press in every line pointed out the certain serious effect of such curtailment and urged upon its readers the expression of their views to their representatives in Congress. The need for crystallization of views on such issues will occur constantly, and the business press can be counted on to do its part in unifying opinion and securing action.

Information Regarding Conditions Abroad

Until recently, the business press has functioned mainly in relation to domestic affairs. Since 1914, however, there has been a rapid increase in the variety and intensity of business paper effort on foreign trade, and, as you well know, it has been a very potent factor in stimulating interest and activity in this trade.

There has been a very lively recognition by the business papers of the importance of foreign trade news, and through slow and difficult sources of information much has been accomplished along these lines. From now forward the task will be easier.

The reason for our former neglect of foreign trade interests is obvious enough. The vast volume of our trade in manufactured goods has in the past been largely domestic, and our business papers, serving their field, were satisfied to act as purveyors of information regarding domestic conditions and developments only. But as American business takes on an international scope, so must the business paper expand. It will no longer do to be concerned with domestic conditions only. World conditions must be interpreted. The American manufacturer and merchant must be able to get from their business paper the same sort of information regarding foreign trade that they now get regarding domestic trade.

One vital way in which the business press is functioning in connection with the promotion of a better understanding of foreign trade is to bring to the attention of the American manufacturers what is being done by competitors abroad who are seeking the same markets.

More than that, because of the close association that exists between the business press and its own clientele there has been on occasion the opportunity to emphasize the mutual values of import and export relations between our manufacturers and the manufacturers abroad. Because the business paper is close to its field and because it sees the necessity for making first-hand studies and investigations of situations, it has an unique opportunity for leadership in the establishment of a better understanding of export or import trade relations of our own manufacturers or consumers.

Spreading Knowledge of American Goods Abroad

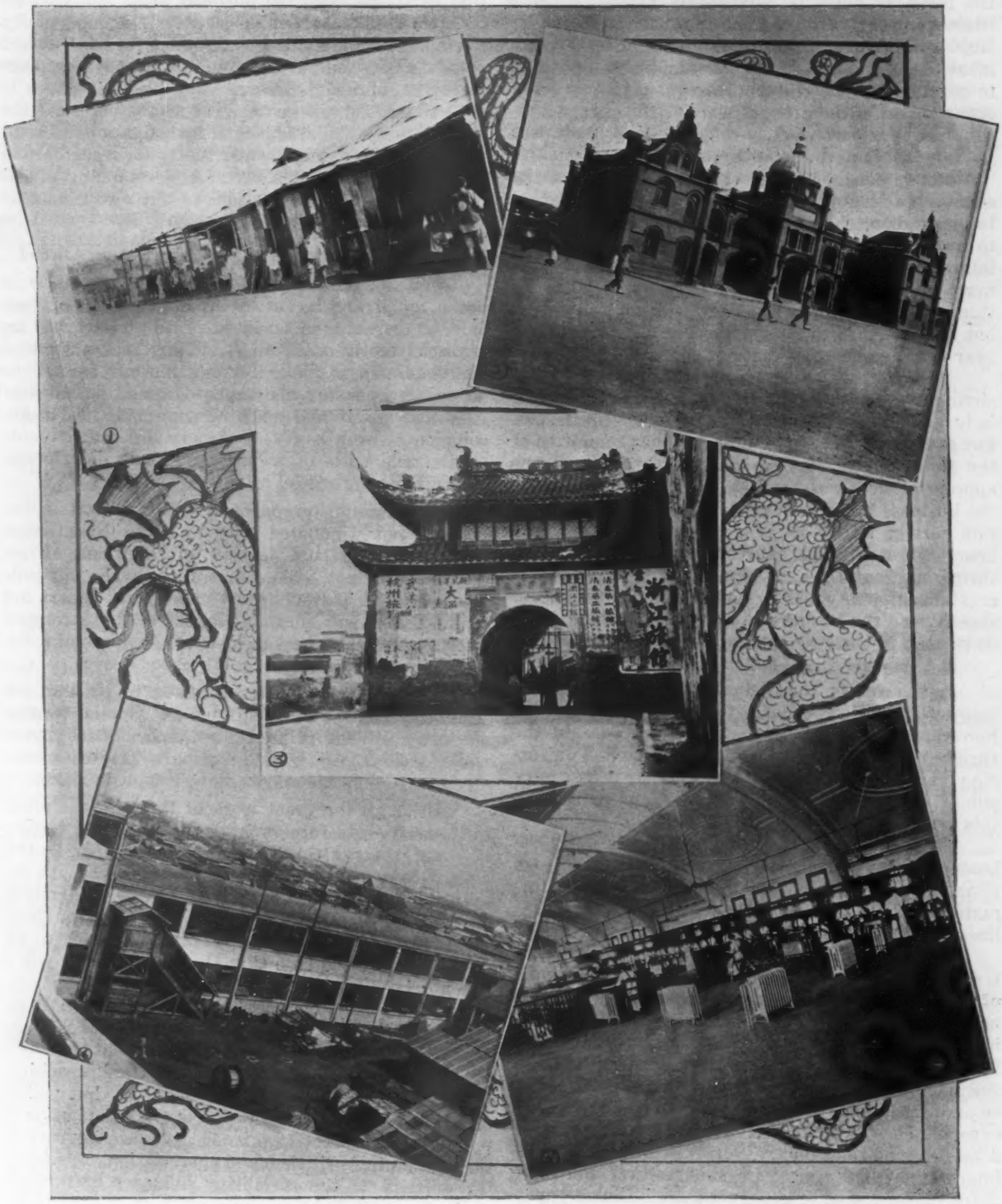
The third function of the business press is to act as an advance agent for American goods abroad. In this respect, the business press already has an enviable record—a record stretching back a score of years. Business paper reading matter, as well as advertisements, are constantly stimulating sales of American goods and machinery abroad. Tales are common of even heavy machinery ordered by cable on the sole basis of a business paper description, record of performance, or advertisement.

This foreign propaganda function was a by-product, not stimulated prior to 1914. No attempt was made to secure foreign subscriptions. They were bought, not sold. Since 1914, a new attitude has developed and publishers of business papers are making, and will continue to make, the strongest efforts to put their periodicals into the hands of influential foreign readers.

Nor are these efforts confined to placing our American editions in foreign hands. Special foreign editions are being printed in a number of instances, while several new business papers, printed exclusively in foreign languages, have been established.

Although the great work of the business press in its relation to foreign trade has only just begun, it is safe to say that every business paper in the United States is awake to its opportunities, its responsibilities and its duty. The general recognition of these factors is already in evidence—the final form into which action will crystallize is yet to be reached. It is too true that their preliminary work has not been above criticism. But they, too, have suffered from the inertia that has characterized the general attitude of our business men toward foreign trade, though in justice it must be said that the more progressive of them previous to 1914 tried preaching a doctrine which they knew to be sound, but which apparently fell on deaf ears. Now, with the business mind in a more receptive mood, they are improving through mutual criticism and appreciation, preaching the doctrine of the stabilizing influence of foreign trade, throwing light on pertinent foreign conditions and going forth to spread in foreign lands the knowledge of American goods and equipment.

And where American business goes, it will find the American paper already in the field. For it is as a herald and a pioneer that the business papers pledge themselves today to the service of the export trade of the United States.



PROGRESS IN THE ORIENT

(1) and (2) Old and new China: railway stations at Hang Chow on the Shanghai, Hang Chow and Ning-poo Railway. (3) Entrance to native city of Zeh-kan, China. (4) Nippon Electric Company Works, Tokyo, Japan. (5) Main Exchange, Shanghai Mutual Telephone Company, Shanghai, China.

Power Developments in Scandinavia

BY J. W. BECKMAN

(The Pacific Coast states, owing to their somewhat similar topography, have a water power situation very like that of Scandinavia. The following article is of special interest to those concerned in the fullest development of Western water power resources, and constitutes a valuable basis of comparison. The author is a member of the Beckman & Linden Engineering Corporation.—The Editor.)

Due to various circumstances, such as legislation, and due to the mental lethargy of the American people—encouraged to a great extent by the availability of cheap sources of energy other than water power—hydroelectric developments have tended to be overlooked and neglected in this country, especially when compared with similar power sources in other parts of the world.

It is often stimulating to see what other people have done along a special line and it is just as often encouraging to see how seemingly insurmountable troubles have been overcome when there was an intelligent public behind an undertaking. The two Scandinavian countries, Sweden and Norway, have been pioneers in hydroelectric development, and it would seem that it might be of interest to get an insight into developments there.

We, in the United States, compared with Norway, are very backward in the development of our hydroelectric possibilities. In our country we have unutilized power possibilities such as Norway never has had. There is no reason to deny that Norway has had some extremely cheap power installations, but in many cases, and perhaps in all of them, the consumers who wanted the cheap power had to move into a desolate wilderness or to an isolated point on the coast line and there install the consuming industry.

Transmission Difficulties

It might be supposed that the power could be transmitted from the generating station to a suitable point for consumption, but in many cases the formation of the country prohibits such transmission lines, snow-capped mountains, glaciers and climatic conditions forming barriers which often render long distance transmission impossible. These are some of the factors which determine the building of hydroelectric plants for industrial purposes, and without knowing all the details connected with the Norwegian developments, it is impossible fully to comprehend their locations. It can be said, with a reasonable amount of correctness, that the larger, readily available, cheap power developments have all been taken up and are utilized for industrial purposes—electrochemical, electro-metallurgical, as well as in the manufacture of wood products.

The estimated average cost of installing hydroelectric power in Norway today is 700 Norwegian crowns, or in dollars—with normal exchange when $1.00 equals 3.75 crowns—$194 per installed kilowatt. The investing public of Norway may be satisfied with a lower rate of return than that of the United States, since this power is obtainable at the bus bars at $19.41 per kilowatt year—a price which supposedly covers all costs such as depreciation and amortization of the plant, as well as operating expenses. The transmission cost is apparently large since the average price of power at the end of a transmission line is $29.38 per kw-yr., while the charge of power to the small consumer through a distributing system is $53.33 per kw-yr. Even these figures are low compared with prices charged under similar conditions in the United States. None of the transmission lines in Norway are of any unusual length.

Map showing water power developments in Sweden. For developments above 25,000 the circles are proportionate to the installed capacity.

Industrial Uses of Electricity

The water power developments in Norway have a most interesting history, and indicate what a financially poor country with a small population can do if it is fully brought to realize the advantages Nature has placed in its grasp. Here it is worth mentioning that industrial developments of all kinds in the Scandinavian countries are due, to a great extent, to the daily papers, which are keen and eager to give to their readers authentic articles on technical and scientific matters—the only way by which a true public interest can be created for the intelligent industrial development of the country.

The first use of Norwegian water power was for the operation of grist mills, flour mills and saw mills. The annual development of water power for such purposes has gone slowly forward at the rate of about 1,500 hp. per annum.

In the seventies the mechanical paper mills were started and later the chemical paper mills were introduced, giving a fresh impetus to the water developments. Between 1895 and 1915, the average annual water development due to the paper industry amounted to 15,500 hp.

In 1895, 700-800 hp. electric energy was generated by water—the birth of hydroelectric developments. During the following five years the total increase of water power developed for the production of electric energy amounted to 15,000 hp., or an average increase of 3,000 hp. per year. During the following five-year period 40,000 hp. of water-generated electric energy was installed, and there was an average annual increase of 8,000 hp.

160,000 hp. additional electric energy was placed in operation during the five-year period from 1905 to 1910, averaging an annual increase of over 30,000 hp.

It is of especial interest that simultaneously with the increased demand for water power for the purpose of generating electric energy, the water had also been utilized in ever increasing amounts in the paper industry, and in 1910 the two interests, the electrical industry and the paper industry, were consuming about the same amounts. 214,000 hp. were used by the paper industry, while for the generation of electric energy 213,000 hp. were operating.

At that time one-third of the electrical energy generated was used for domestic purposes, and two-thirds were absorbed by industrial demands.

During the following eight years Norway has made enormous strides in the electrochemical industries and, consequently, the growth of the power generating industries has been stupendous. In 1910, 15,000 hp. were consumed in electrochemical industries, while in 1918, 770,000 hp. operated on these industries. The domestic demand for power has not grown at all in proportion with that of the industries, and is represented by a very small percentage of the total today.

Small Hydroelectric Developments

Sweden is a strip of land approximately the same size as the Pacific Coast states of the United States, dotted throughout its length with various industries which have developed their own source of power as one of the inherent parts of the industrial activity. A new industry contemplating starting operation in this country makes its first question, "Where is the nearest power line?" while in Sweden and Norway under the same conditions the question is, "Where is the nearest power source that can be developed?"

The result of this attitude in Sweden is indicated by the following official tables of 1913 and 1917, showing use of developments and number of developments in Sweden, and illustrating in a marked way the position of the small developments.

Size of Equipment in Turbine Hp.	1913 Number of Plants	Total Number of Turbine Hp.
50,00 or more	1	80,000
25,000—50,000	2	68,000
10,000—25,000	6	109,000
5,000— 1,000	18	116,000
1,000— 5,000	126	245,000
200— 1,000	296	132,000

Size of Developments	1917 Number of Installations	Turbine Hp.
0— 999 Hp.	618	171,503
1,000— 1,999	78	110,701
2,000— 2,999	29	69,382
3,000— 3,999	14	46,690
4,000— 4,999	13	58,735
5,000— 5,999	10	55,250
6,000— 6,999	2	12,515
7,000— 7,999	3	22,510
8,000— 8,999	3	25,260
9,000— 9,999	1	9,530
10,000— 10,999	2	21,100
12,000— 12,999	3	37,000
18,000— 18,999	1	18,610
20,000— 20,999	1	20,000
21,000— 21,999	2	42,800
22,000— 22,999	1	22,950
24,000— 24,999	1	24,360
32,000— 32,999	1	32,800
42,000— 42,999	1	42,000
56,000— 56,999	1	56,240
75,000— 75,999	1	75,525
129,000—129,999	1	129,625
	787	1,105,096

The following table indicates the uses the power was put to in 1913:

	No. of Turbine Hp.	%
Iron industry	215,000	29
Paper and pulp industries	240,000	32
Textile industries	40,000	5
Electrochemical industry	90,000	12
Power—distribution and miscellaneous	165,000	22

Very radical changes have taken place since then in the Swedish iron industry as well as in the electrochemical field.

Electric pig iron manufacture has grown rapidly and 70,000 hp. are used in these furnaces alone. The consumption of electric energy for electrochemical manufacture in Sweden in 1917 was 126,000 hp. and has grown considerably since then.

It may be interesting to compare the water power reserves of the Scandinavian countries—the two European countries that are most richly endowed—with those of the United States of America. The figures are given in the table below.

ESTIMATED POTENTIAL WATER POWER

	Million Hp.	Hp. per 1000-Inhabitants
Norway	7.5	3020
Sweden	6.2	1050
United States (approx.)	54.0	490

As to developed water power, comparative figures are still more interesting, as shown in the accompanying table.

DEVELOPED WATER POWER

	Population (millions)	Total Dev. Hp.	Hp. per Inhabitant
Norway	2.5	1,250,000	.5
Sweden	5.5	1,100,000	.2
Oregon, Washington, California	5.0	941,000	.188

If hydroelectric power were developed at the same rate on the Pacific Coast as in Norway, 2.5 million horsepower would be developed which would mean that close to one-quarter of all available power was working producing energy there.

The Scandinavian countries suffer in a marked degree from shortage of fuels. Wood is practically the only native fuel source, and as an energy it is practically prohibited. On this account water power developments are of primary importance there. In the United States of America coal and oil have been plentiful, but here as in all other parts of the world the true conservation is that which is applied in the Scandinavian countries, making the "White Coal" work by the fullest development of all water power sources, both big and small.

California Precipitation

BY ANDREW H. PALMER

(Rainfall in California is now, in all probability, complete for the present season, and the following article—the second half of which will appear in the next issue—includes a complete survey of data which could only be touched upon in an article on this important subject published earlier in the year. The author is Meteorologist with the U. S. Weather Bureau.—The Editor.)

When a state is so largely dependent upon precipitation as is California, rainfall data attain the importance of vital statistics. The water problem in California, as in most states lying west of the Mississippi River, is of great economic importance. The East has no water problem comparable in magnitude with that of the West. As pointed out by Dr. C. E. Grunsky, in his interesting paper, "Some Notes on California Rainfall," published in the March 1 number of the Journal of Electricity, in no other state does the public watch the rainfall statistics so closely as in California. The water provided by the springs, streams and wells of California has aptly been termed the life-blood of the state.

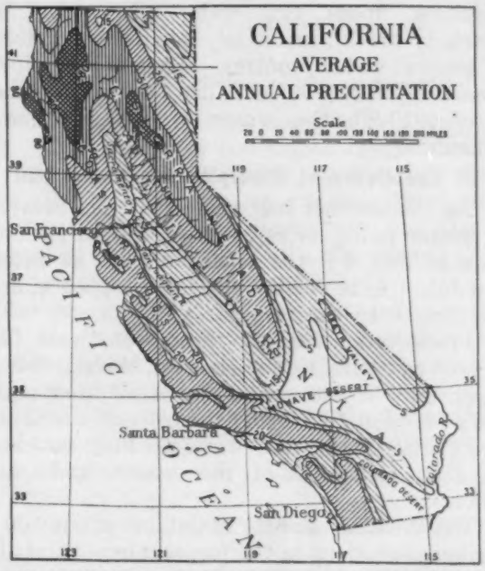


Fig. 1.—Map of California showing average annual precipitation in inches. It will be seen that there is heavy precipitation in the mountain regions and very little in the interior basins and the southeastern plateau regions.

Precipitation is the technical term universally employed by meteorologists to include rain, melted snow, hail, sleet, dew and any other moisture which reaches the ground in measureable amounts. The unit of measurement in the United States is one hundredth of an inch. For example, when the precipitation on any day is recorded as 0.06 inch, it means that moisture was precipitated to the ground in an amount equivalent to a layer of water 0.06 inch deep. It is also of interest to know that a precipitation of 0.01 inch is equivalent to slightly less than one ton of water to the acre.

As indicated in Figure 1, the average annual precipitation in California ranges from one or two inches per year, in the Mojave Desert, to more than 80 inches per year in the Sierra Nevada Mountains and in the northern portions of the Coast Range. Within the state are also included the region of greatest known snowfall in the United States, and regions in which snow of measurable amount has never been known to fall. There is a general increase in average precipitation from the southeast to the northwest. Moreover, the mountains are regions of heavy precipitation, while the interior basins and the southeastern plateau regions receive deficient precipitation. Records show that there is an increase in average annual precipitation up to a height of 5,000 feet in the Sierra Nevada, and a decrease above that height. While there are many exceptions, the rate of increase up to 5,000 feet in elevation is about 8.5 inches per annum for every thousand feet.

Unequal Distribution of Precipitation

The ultimate source of practically all the precipitation in California is the Pacific Ocean. As the moisture is brought in by westerly winds, the eastern and northeastern slopes of the mountains receive much less precipitation than the western and southwestern slopes. The precipitation is unequally distributed throughout the year, winter being the wet season, and summer the dry season. Toward the north the distribution of rainfall through the year becomes more nearly equalized. In southern California about 90 per cent of the annual precipitation occurs during the winter half-year, while in northern California the proportion is about 75 per cent.

The heaviest recorded precipitation for a calendar year in California is 156.90 inches, which occurred in 1911 at La Porte, Plumas county, altitude

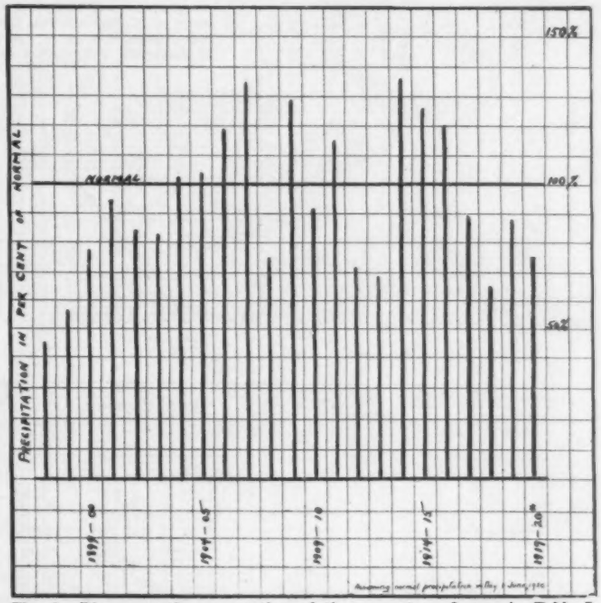


Fig. 2.—Diagrammatic presentation of the percentage figures in Table I, showing the average precipitation for about 300 stations in California from 1879 to 1920.

5,000 feet. Nearly every year at one or more stations precipitation is recorded exceeding 100 inches. As the greater part of the annual precipitation is recorded during six months, extraordinary amounts sometimes fall within short intervals. The greatest amount recorded in one month is 71.54 inches, which fell during January, 1909, at Helen Mine, Lake county, altitude 2,750 feet. The greatest amount recorded in 24 hours is 16.71 inches, which fell January 16-17, 1916, at Squirrel Inn, San Bernardino county, altitude 5,280 feet. At Campo, San Diego county, altitude 2,543 feet, 11.50 inches of rain fell in 1 hour and 20 minutes, on August 12, 1891.

By way of contrast, consider the record of Bagdad, San Bernardino county, altitude 784 feet, where no measurable rain fell from October 3, 1912, to November 8, 1914, inclusive, a period of more than two years. At Indio, Riverside county, 20 feet below sea level, no measurable rain fell from November, 1893, to January, 1895, a period of more than a year. At several stations in the Imperial Valley and at one in Death Valley, both of which depressions are below sea level, there have been periods of a year or more in which less than an inch of rain fell.

Importance of Snowfall

Since most of the precipitation comes during the winter season, the elevated portions of the state have abundant snowfall. Tamarack, Alpine county, altitude 8,000 feet, has an average winter snowfall of 43.4 feet, based upon a record of eight years. Nearly all the stations in the higher portions of the Sierra Nevada Mountains receive more than 100 inches of snow every winter. The greatest amount recorded during one winter is 73.7 feet, which fell at Tamarack during the winter of 1907-7. From 40 to 50 feet of snow has been known to accumulate on the ground at one time in the high Sierra Nevada. The importance of this snowfall has been pointed out by Professor R. DeC. Ward, president of the American Meteorolological Society, in an article entitled, "Mean Annual Rainfall of the United States," in the Monthly Weather Review of July, 1917:

"The Sierra Nevada Mountains well deserve their name. To them California owes much, if not most, of her present prosperity and her promise for future growth and development. The many feet of winter snowfall which accumulate on the upper slopes mean millions upon millions of dollars each year to the farmers and fruit growers of southern California. Were all this precipitation to fall as rain, every winter would witness devastating floods, and every summer would wither and destroy the crops."

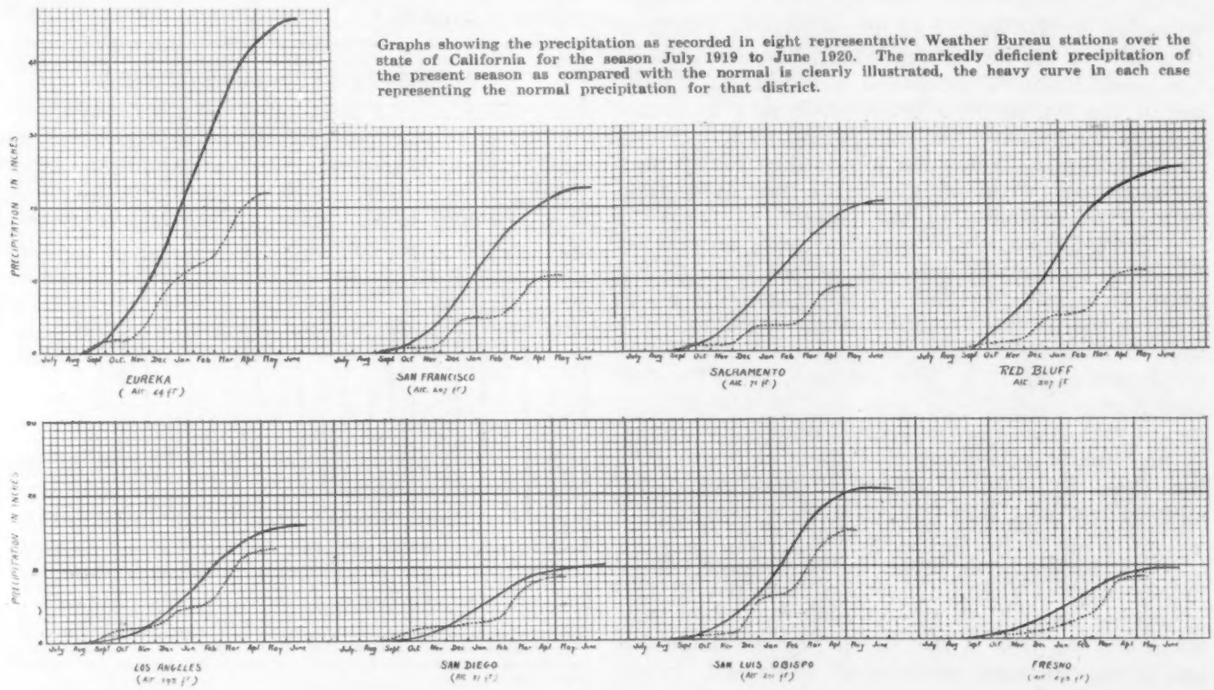
As may be surmised from the foregoing, California has a water problem of great complexity. The foundation of it lies in the nature of the precipitation —its irregular distribution both in time and place. Irrigation, floods, city water supply and hydroelectricity are all intimately related subdivisions of the general water problem. When the precipitation is markedly deficient, as it has been during the season of 1919-20, the water problem becomes preeminent.

The Deficient Precipitation of 1919-20

As the summer half-year is the dry season, and the winter half-year is the wet season, it is appropriate to consider the seasonal year as extending from July 1 to the end of the following June, and not coinciding with the calendar year.

Precipitation data for the seasonal year 1919-20 are now available to the close of March, 1920. As 88 per cent of the seasonal precipitation normally occurs between July 1 and the close of the following March, little additional rainfall may be expected during the remainder of the season under consideration.

The Weather Bureau maintains about 300 well-distributed stations in California where rainfall data are obtained from standard instruments. Based upon records kept at these stations, the average precipita-



Graphs showing the precipitation as recorded in eight representative Weather Bureau stations over the state of California for the season July 1919 to June 1920. The markedly deficient precipitation of the present season as compared with the normal is clearly illustrated, the heavy curve in each case representing the normal precipitation for that district.

TABLE I
Seasonal Precipitation in California, 1897-1920.
Averages of about 300 stations.
Normal is 26.78 inches.

Seasonal year (July-June)	Average Precipitation (inches)	Percentage of normal
1897-98	11.93	45
98-99	15.42	57
99-00	20.83	77
1900-01	24.92	93
01-02	22.40	83
02-03	22.10	82
03-04	27.36	102
04-05	27.60	103
05-06	31.98	119
06-07	35.82	134
07-08	20.10	75
08-09	34.47	129
09-10	24.43	91
10-11	30.76	115
11-12	18.90	71
12-13	18.50	69
13-14	36.37	136
14-15	33.69	126
15-16	32.12	120
16-17	23.85	89
17-18	17.54	65
18-19	23.59	88
19-20*	19.92	74

*Assuming normal precipitation in May and June, 1920.

tion for California has been found to be about 26.78 inches. That figure is considered the normal seasonal precipitation. In Table I are given figures showing the average seasonal precipitation for California for the past 23 seasonal years, and the percentage of each as compared with the normal. These data are shown graphically in Figure 2.

The season 1919-20 has been one of the most remarkable on record, and in some respects it is the most extraordinary. A brief review of the season is worthy of consideration.

October, the month which usually marks the advent of the rainy season, brought deficient precipitation, the average for the state being but 43 per cent of the normal. What little rain fell was limited to the mountain and plateau regions. Cold, dessicating, northerly winds prevailed throughout the state.

Unusually cold and dry weather occurred in November. The average precipitation for the state was but 32 per cent of the normal. Some snow fell in the Sierra Nevada Mountains near the close of the month, but the total snowfall was everywhere less than normal.

Temperature and precipitation were both below normal in December. Snowfall in the mountains was light. At the close of the month the accumulated seasonal precipitation was everywhere deficient, the deficiency being most marked in northern and central California, where less than one-half of the normal precipitation had been received.

The driest January on record in California is that of 1920. At some stations where records of 70 years were available, no January has brought less precipitation. Four stations received no measurable rainfall. The average precipitation for the state was 0.85 inch, but 16 per cent of the normal. This is usually the wettest month of the year, the normal precipitation being 5.41 inches. At the close of the month the accumulated seasonal precipitation was about 40 per cent of the normal in northern and central California, and about 50 per cent of the normal in southern California. Snowfall in the mountains was markedly deficient, and at all elevated stations from which reports were received there was less snow on the ground at the close of January than at

TABLE II.

ACCUMULATED SEASONAL PRECIPITATION IN INCHES

Normals—Upper figures. Season of 1919-20—Lower figures.

STATION	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Eureka	.11 .01	.21 .02	1.32 1.54	3.97 1.78	9.64 4.77	16.89 9.10	24.52 10.97	31.55 13.03	38.52 18.78	42.45 21.92	45.00	46.05 .....
Fresno	0 0	0 0	.27 .29	.99 .58	2.02 .62	3.55 1.51	5.15 2.20	6.48 3.52	8.24 7.66	8.95 8.20	9.58	9.68 .....
Kernville	.19 0	.27 0	.48 0	.91 .12	1.68 .51	2.69 1.81	5.06 2.83	7.47 4.53	8.71 8.21	9.10 10.48	9.55	9.58 .....
Los Angeles	0 0	0 0	.06 1.29	.83 1.85	2.31 2.31	5.21 4.30	8.05 4.80	10.96 7.12	13.96 11.37	15.09 12.41	15.57	15.64 .....
Quincy	.10 0	.23 0	1.52 3.49	4.20 3.82	9.31 4.52	15.29 11.34	25.62 11.86	31.62 15.26	38.54 23.80	41.00 28.37	43.24	44.00 .....
Red Bluff	0 0	.02 0	.82 .66	2.40 1.02	5.59 1.34	10.08 4.09	14.02 4.65	17.64 5.38	21.40 9.44	23.25 10.58	24.57	25.03 .....
Sacramento	0 0	.01 0	.40 .53	1.44 .54	3.59 .90	7.12 3.12	10.81 3.41	13.95 3.79	16.96 7.39	18.96 8.81	19.94	20.09 .....
San Diego	0 0	0 .01	.06 .27	.52 1.31	1.35 1.74	3.17 2.22	5.17 2.65	7.13 5.45	8.83 7.96	9.57 8.45	9.98	10.01 .....
San Francisco	.01 .01	.01 .01	.30 .40	1.59 .67	4.06 1.11	8.30 4.32	12.63 4.58	16.33 5.47	19.47 9.06	21.29 10.42	22.10	22.27 .....
San Luis Obispo	.01 0	.05 0	.49 .42	1.82 .54	3.52 .68	5.86 5.20	10.50 6.02	14.08 8.29	18.06 13.04	19.54 14.77	20.41	20.51 .....
Sisson	.16 0	.45 0	1.35 1.26	3.89 1.39	8.25 1.69	14.38 4.95	22.62 5.35	28.22 6.10	33.62 10.19	35.98 14.54	38.13	38.80 .....
Summit	.24 0	.34 0	.78 .10	2.95 1.10	6.95 2.90	14.24 9.40	24.00 11.40	31.83 15.40	40.19 26.50	44.41 32.70	46.45	47.03 .....
Squirrel Inn	.07 0	.21 .20	.65 4.25	1.87 4.38	5.14 7.34	10.75 11.05	18.94 11.41	24.25 19.94	33.27 32.50	35.43 34.86	37.06	37.32 .....
Yosemite	.20 0	.48 0	1.92 1.22	3.49 1.91	6.32 2.51	12.10 7.76	20.25 9.39	25.30 12.21	33.18 18.90	35.31 23.42	36.62	37.43 .....
State*	.04 .01	.12 .04	.61 1.02	2.06 1.65	4.87 2.55	8.90 6.42	14.31 7.27	18.72 10.07	23.46 15.88	25.25 18.39	26.47	26.78 .....

*Average of 300 stations.

the close of the preceding month, an extraordinary condition. As an example of the unusual weather of the month, attention is invited to the fact that the greatest snowfall reported in the state was but 24 inches, at Tamarack, Alpine county, altitude 8,000 feet. The normal January snowfall at that place is 187 inches. Nowhere was there appreciable run-off from melting snow, and most streams maintained the lowest stages ever recorded during January, the month which usually marks the middle of the rainy season. Some streams maintained lower stages than those of midsummer. Because of the prolonged drought, ranges deteriorated, stock had to be fed, and some cattle were shipped to neighboring states for pasturage. Numerous orchards had to be irrigated in order to save the trees, an almost unprecedented condition for January.

Deficient precipitation was received during February also. It was the driest February in seven years. While more rain fell than during the preceding month, the average precipitation for the state was but 63 per cent of the normal. At the close of the month the accumulated seasonal precipitation was but 35 to 45 per cent of the normal in the northern and central portions of the state, and 70 to 80 per cent of the normal in southern California. The snowfall in the mountains was markedly deficient, and the amount of snow on the ground at the close of February was only about one-third of that usually to be found at that time of the year. Streams maintained extremely low stages, and in some places the ground water receded below levels reached by suction pumps. In northern California the stages of most streams were the lowest of record for February, and springs which had never been known to cease flowing were rapidly drying up. In some places farmers had to haul water for domestic purposes. In the agricultural portions of the Sacramento and San Joaquin valleys the ground was moistened only to plow depths, and the subsoil remained dry. In southern California conditions were not so critical, as heavy rains fell during the latter part of February and continued into March. At the close of February the accumulated seasonal precipitation was heavier in southern California than elsewhere in the state, a condition just the reverse of that which usually obtains.

During March, generous rains fell in the agricultural portions of the state, and the snowfall in the mountains was abundant. However, the accumulated deficiency during the early portion of the season had become so great that the abundant precipitation of March was insufficient to bring the seasonal precipitation up to the normal anywhere in the state. In the San Joaquin Valley more rain fell during March than during the whole of the preceding eight months of the present season. On April 1 the accumulated seasonal precipitation was less than 50 per cent of the normal in central and northern California.

Comparative statistics are given in Table II and are shown graphically in the accompanying figures. The diagrams illustrate clearly the markedly deficient precipitation of the present season as compared with the normal.

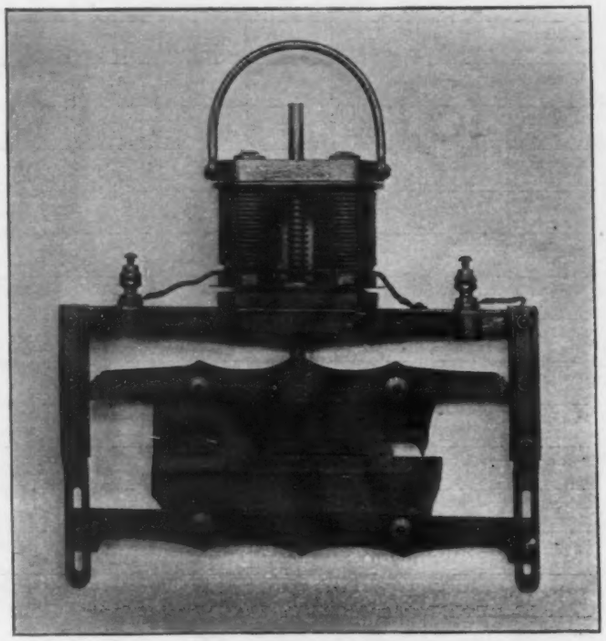
THE FIRST ARC LAMP IN SAN FRANCISCO

BY FRANK E. SMITH

(The following interesting account of very early days in California's electrical history is by the Western representative of the Weston Electrical Instrument Company. The lamp referred to is still in the writer's possession.—The Editor.)

The Wallace-Farmer arc lamp which is shown in the photograph was the first arc lamp to be tried out in the city of San Francisco in the year 1878. At that time the late Mr. George H. Roe who was to become president of the first central station lighting system in the world was in the brokerage business and had taken some electrical apparatus as security on a note. When the note fell due the owner was unable to meet his obligation and it was discovered that the endorsers were irresponsible and therefore Roe and Plummer (the man with whom Roe was in business) were forced to take the apparatus. Shortly after this the firm of Roe and Plummer dissolved partnership and in the settlement of the partnership affair the electric machinery fell to Mr. Roe as a part of his share in the firm. He immediately employed a man to make experiments with the machine and lamp and had it moved to a planing-mill near the corner of Spear and Market Streets. After connecting the dynamo to the lamp by the necessary wires and connecting the dynamo to the line shaft of the mill by a belt, the apparatus was found to be in working condition, but the light given by the lamp was not very satisfactory.

Mr. Roe became very enthusiastic and after considerable expense had a fairly good electric arc lamp manufactured locally to be used with the Wallace-Farmer dynamo. The new lamp was very much more effective than the Wallace-Farmer lamp and Mr. Roe became convinced that the electric light business was one with money in it, and on June 30,



The Wallace-Farmer arc lamp which was tried out in San Francisco in the year 1878

1897, he associated with himself, Mr. John Bensley, Mr. O. F. Willey, Mr. James R. Hardenburg, and Mr. R. A. Robinson and incorporated the California Electric Light Company which he had organized and which proved to be the first incorporated electric light company for central station lighting in the world.

The writer was employed by the California Electric Light Company as electrical engineer in 1886 and one of his first acts was to rid the station of all the superfluous and antiquated material. In the discard this lamp was found.

The history of the lamp alone is not particularly interesting except that it was among the first to be manufactured for strictly commercial purposes, and while being anything but a commercial success, this particular lamp did play the leading role in what has proven to be one of the greatest industries in the world, namely, central station electric lighting, which in itself was the beginning of the electrical industry. The old California Electric Light Company was later succeeded by the Edison Light and Power Company, which was superseded by the San Francisco Gas & Electric Company, which became a part of the Pacific Gas & Electric Company.

The Value of Color in Window Displays

BY BERNADINE MEADOWS ANGUS

(Our Chinese neighbors can give us many hints in the art of using color, and the contractor-dealer will do well to study the use of color in some Chinese window displays. It is the woman who buys electrical appliances, and the important part played by color in attracting the woman shopper is taken up in the following article. The author was formerly instructor in the Los Angeles School of Design.—The Editor.)

In the San Francisco Chinatown $30,000,000 worth of business is done a year. The greatest per cent of sales is made from window displays. The Chinese stores do not advertise in the newspapers and if you have ever been in one, yon know that Chinamen are not salesmen.

Whether the Chinese merchant is selling tea or priceless jades he knows that a gorgeous window display will attract people into his shop.

A tea merchant who sells more tea than any other merchant in Chinatown has a window display that would be a fitting background for precious gems. He has arranged bits of gold and silk woven brocades on a plain background, and grouped the little cans of tea covered with bright Chinese silks in an interesting manner. Hardly a woman passes this window who does not stop and his sales of this commonplace article are tremendous.

Color attracts a woman to a window when nothing else will. Not a jumble of all colors mixed up together, but a harmony of well selected colors, with one dominant note.

A large jewelry store in Los Angeles has such unique dindow displays that there is always a crowd around them. Color is the dominating feature. The window is not deep, and this gives the spectator a closer view of the articles displayed.

The back of the window is cased up in small panels; these are changed to conform to the display. In a Spring effect, the general color scheme was rose, in the panels at the back exquisite little paintings of Spring subjects were inserted. These were made by a clever commercial artist, who made them especially for the display on inexpensive material, but getting an artistic effect.

A pool effect was obtained in the center of the window by a large flat mirror, the edges lost in folds of emerald silk. A crystal bowl held drooping ferns and spring flowers. Butterflies tipped sprays of each blossoms. Diamonds and emeralds were the only jewels displayed.

Their Oriental window held innumerable crowds for a week. It was a miniature interior of a temple. A buddha placed high on an altar had many little steps leading up to it. Incense burned in tiny containers, and dozens of little figures, robed in gor-

Display your electric appliances as a jeweler displays silver, not as a hardware man displays hammers and nails. By an artistic use of color and design the most exquisite effects may be obtained in electrical window displays.

geous silks carrying trays of dazzling unset gems were grouped on the steps going up to the buddha and coming with their gifts through the temple arches. The general tone of the setting was dark and somber, depicting the atmosphere of the temple; this gave the gorgeous robes of the figures and the sparkling gems greater contrast. These are but two of their many unusual displays, that cause more comment than any other display of the kind in the city.

No matter what had been displayed in these windows, whether tooth paste, or hardware, people would have stopped and looked and become interested in that particular store.

It isn't the thing you display, it is the way you do it. Meat is probably the ugliest display ever put in a window. Great hunks of bloody beef, hanging on a hook are anything but appealing, but there is a butcher's window on Market street in San Francsico that brings that market hundreds of dollars in trade. A freezing plant is installed in the window and the meat is arranged on white enameled platters. Each piece is surrounded with green lettuce and parsley. The general color effect is white and green—a very clean looking combination. The fat on the meat is cut in curly-cues, and the tips are covered with fancy paper. The window is so clean and fresh that it inspires the woman shopper to go out of her way to trade at that market. The window sells the goods.

Electric appliances are seldom displayed to their best advantage. Most electrical goods are displayed like hardware. There are more possibilities in displaying these goods than many other articles that are attracting attention and bringing business to the merchants.

The woman shopper must be attracted. She is the one who selects these things for her home. To compel a woman to stop and examine a window display, something must appeal forcefully.

A window display that many women would stop to look at would be a dining tea table set for afternoon tea. A rug should be placed in the floor of the window; plain folds of material or an attractive screen to form the background; a wicker tea-table and a couple of chairs. The tea-table should have an attractive lace cover and a bowl of bright colored flowers in the center and be perfectly equipped with an electric tea service, a coffee percolator and toaster. Don't put everything in the shop on the table—you will lose the exclusive effect of the tea and coffee service. The afternoon tea hour is one of the most popular serving times of the day and women take great pleasure in having a perfectly equipped tea-table.

An electrical breakfast table would have great interest for the housewife. A woman likes to see things as they look in use. That is why gowns are displayed on figures instead of in boxes. A desire for a thing is created by seeing it as it looks to others.

The greatest mistake the dealer makes is crowding a window full of every kind of thing he has in the store. In the first place this confuses the mind of the observer, and second and most important, it takes away the exclusive quality of the goods. In any other line of business a crowded, over-stocked window is the sign of a cheap place—the five and ten cent stores are an example.

An exclusive millinery store puts one or two hats in a window, displayed against an artistic background. They do not pile all the hats in stock in the window to show they have them. A patron knows they have more than those shown in the window and goes in to see them.

An interesting and attractive color arrangement for a window displaying lamps, percolators, toasters, etc., would be a background of bright electric blue. The floor of the window covered with a neutral color —gray or putty; several exclusive electric appliances placed on silver trays, that reflect the polished surfaces of the articles and accentuate their grace and beauty. Flowers of yellow or gold color in a crystal bowl add an accent to the arrangement. These articles can be made to appear so elegant, by their arrangement and surroundings, that the price will seem small to the purchaser. As they are usually displayed, $20.00 and $25.00 seems high for a "coffee pot."

Display your electric appliances as a jeweler displays silver, not as a hardware man displays hammers and nails.

When showing table lamps, have a library table with a rich cover and show lamps one at a time on this, so the patron can see how it will look on her own table. Floor lamps should be shown on a rug instead of the regular floor of the store. The atmosphere around a thing is what makes it appealing or commonplace.

Enthusing a Sales Force

(In the many plans evolved for creating working enthusiasm, those based on the principle of competition have usually been the most successful. The following simple and elastic system is described in one of the interesting pamphlets recently issued by the Hammermill Paper Company of Erie, Pa.—The Editor.)

How shall the executive tap the spring of enthusiasm so as to get the best results from his men?

One answer is: make their work a game and teach them to play it for the sake of the contest. But make the contest a fair one so that jealousies and mean rivalry will be avoided and the best in a man be brought out.

Making It a Game —

Larger business houses of America acting on this principle have gone to great lengths to foster the game spirit among their men—especially among salesmen. They set a goal which any man who tries may reach, a goal not too easy for the strong man and not too hard for the weak man. Then they arouse the competitive spirit, taking great care to even the chances so that every man will have a chance to develop his ability and to partake of the sport. Finally, they offer honors and rewards to the leaders as visible evidence that the game is not one-sided and that the house is willing to divide with them the profits from increased business.

Practical for Any Concern —

Valuable as the method is of stimulating salesmen, both wholesale and retail, to renewed effort, the plan has been reluctantly neglected by many smaller concerns because of the difficulty of keeping it up. It is hard to arrive at a fair basis; the cost of keeping up the system has been thought to be excessive; the

SALESMEN'S REPORT

DEPARTMENT _____ August 1918

SALESMENS' STANDING

WEEK OF August 5th

NAME	SALES	SALARY	%	STANDING	NAME	STANDING
L. M. Clark	641.—	125	19.50	7	T. S. Williams	1
C. C. Wilson	891.—	100	11.20	2	C. C. Wilson	2
R. T. Brown	420—	75	17.86	6	F. L. Wolf	3
N. N. Adams	679—	90	13.25	4	N. N. Adams	4
A. T. Madison	341—	100	29.33	8	R. N. Finley	5
F. L. Wolf	1180—	150	12.71	3	R. T. Brown	6
R. N. Finley	590—	100	16.95	5	L. M. Clark	7
T. S. Williams	973—	85	8.74	1	A. T. Madison	8

This form, used to arouse the competitive spirit in a sales force, may be posted in some conspicuous place or mailed to the men in the field. It is made up every week and gives each man's standing, based on his salary divided by his sales for the week. The system can be adapted to almost any kind of business.

shortage of labor has been a contributing factor; and it is difficult to find a way to put the affair on a business footing. Such objections are not unreasonable.

An Indianapolis concern has, however, worked out a simple system which is at once a guide to the manager in discovering the worth of his men and a spur to greater effort to the men who are representing the house in the city and on the road. The plan used is simple, easy to keep up, and for smaller concerns quite as effective as the charts, graphs and similar elaborate records used by some houses. This method is an adaptation of the percentage system and lends itself to an infinite variety of interesting contests.

Salesmen's Rating —

The form used to record results is shown here. It is divided into two parts, one for the sales manager and the other for the men, the perforated line marking the division. The standing of the salesmen whose names were written on the form was determined by this simple process:

The names of all the men to be graded were written in the Name column of the Salesmen's Report section. Next the amount of their sales for the month was entered in the Sales column and the amount of salary earned posted from the pay roll in the Salary column. As the third step, the amount of salary earned by each man was divided by his sales to find his percentage. The figures were entered after each man's name in the Per Cent column. Finally, each man's standing was determined by comparing the various percentages. The salesman who showed the lowest percentage was graded No. 1 and others were ranked accordingly. Then their names were written in the Standing column of the Salesmen's Report section. When this simple task was completed the names and the rank of each salesman were written in the Salesmen's Standing section. This section may be detached and posted where every man may see it or copies may be sent to the men on the road.

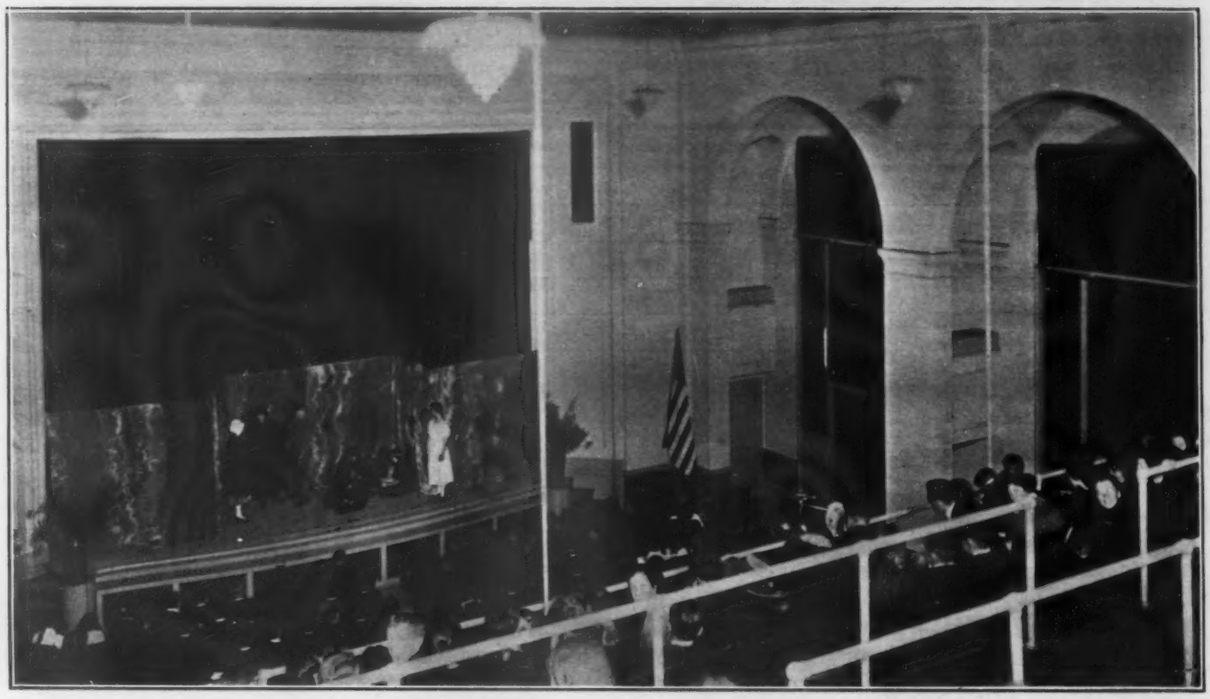
This record, of course, was taken on the sales of one line and would not do for salesmen selling a large number of lines at varying rates of profit and expense. The principle of percentages on which the form is based may, however, be adopted without change. If the amount of sales of a certain line or lines is not a fair basis, the percentage of selling expense for the month may be the grounds for the contest. Salesmen may also be graded on the percentage of sales quota filled. The amount of profit made may be a fair way of figuring. Gain over the previous year's business, complaints, canceled orders, bad accounts, new orders, may all be factors on which to base a contest. But no matter what variation ingenuity suggests, the simple little form which has been illustrated will go far in telling the busy manager or proprietor little and big truths about the ability of his men.

Suitable for Retail Stores —

The plan is suitable for retail stores as well as for wholesalers, and if the store is too large a unit, it may be kept by departments. In the shop the basis may be the output of the worker. In short, the record, with but slight modification, may be adapted to almost any line of business.

In all cases the use of the simple and inexpensive system will speed up sales or whip up production as the case may be. When it is used, there need be no guessing on the part of an employe as to how he stands with the firm. Each man will be spurred in his efforts by the certainty that the man next above him will leave no stone unturned to advance or at least to hold his grade.

In this way the executive may bring system into his work and enthusiasm to his men. By his organization working precisely and accurately he can secure the fullest returns from dollars invested in his working force, and he will probably find also that the stimulated personal interest is an intangible asset which is worth while in itself, quite apart from any material return.



A view of the auditorium of the Francis E. Willard grammar school of Berkeley, taken during the production of a series of tableaux which not only served to visualize the story of Evangeline for the boys and girls who had been studying that poem, but also awakened their interest in the striking effects which can be brought about through the use of electricity. The spot light machine which furnished the only light used during the production can be seen at the front of the balcony.

Electricity and the School Entertainment

(The future of the electrical industry depends upon the boy and girl of today, because they are the purchasers of tomorrow. This story of the introduction of electricity into a school entertainment is an example of the many practical ways in which the electrical manufacturer, jobber and contractor-dealer can stimulate the child's interest in electricity so that the electrical idea will be carried into the home of today and will become a part of the public mind of the future. —The Editor.)

The public school presents an ever growing opportunity to men of the electrical industry whether their business be the supplying of power, the installing of lighting and cleaning systems, or the furnishing of magic lanterns and appliances for vocational departments. Furthermore, it is becoming clear that the school is not only a noteworthy consumer of electricity but also a medium through which the electrical idea can be sold to the most obscure home. What happens in the American school is discussed in the American home, and so the electrical dealer can rest assured that every application of electricity in the school house, from the cleaning of rooms to the presentation of entertainments, will be discussed beyond the school house walls.

Interest in Entertainments

No part of school life interests the girl or boy more than the school entertainment, therefore it is true that here, especially, will the application of electricity awaken their interest.

The simple and inexpensive way in which electricity can be used in making the grammar school entertainment effective was demonstrated a short time ago in the auditorium of the Francis E. Willard school of Berkeley, California.

The seventh and eighth grades had been studying Longfellow's poem, "Evangeline." In order to make the more important scenes vital to the children, the teacher asked one of the eighth grade girls to give a reading of the poem at one of the Friday

Scenes which were presented during the reading of the first portion of Longfellow's "Evangeline." The Arcadian maiden herself, the betrothal scene and a picture of the lovers in the moonlight comprised this happy group. In each case the color of the spot light used brought out the emotional tone of the particular scene.

The picture of the parting of the lovers occasioned by the deportation of the villagers of Grand Pres was followed by two tableaux which told the story of the wanderings of Evangeline along the great Mississippi in search of Gabriel. One shows the awakening of Evangeline as she feels that her lover is passing in a near-by boat, and the other shows her meeting with Gabriel's father on the day after the latter has left for the North.

afternoon entertainments. But the child, believing that "things seen are mightier than things heard," lost no time in planning a series of tableaux to illustrate the lines she had selected to read.

The Need of Electricity

Then there arose the problem of making these pictures effective enough to hold the attention of the most unpoetical boy in school. After some pondering, the young eighth grader asked the advice of a friend from the General Electric Company, and between the two a most adequate scheme of production was worked out. A strong incandescent spot light with a colored disk wheel comprised the necessary electrical equipment.

A plain setting to bring out the tableaux was obtained through the use of a simple cheese cloth curtain which had been dipped in blue green dye and wrung out while wet so that a mottled effect was produced.

When the auditorium became totally dark, on the afternoon of the production, a strong white spot light served to focus the attention of the most restless lad upon the center of the stage where the young interpreter read the introduction to the story of Evangeline. Then she took her place at the side of the stage, from where the interpretation of the following tableaux was read. The electrical co-worker had arranged a shaded amber colored mazda lamp behind the cheese cloth curtain so that the child could see to read without the use of a noticeable light which would detract from the tableaux effect.

For a moment the stage was totally dark, then Evangeline appeared in the center of a golden circle of light. And every child heard with new meaning the lines:

"Fair was she to behold, that maiden of seventeen summers.
Black were her eyes as the berry that grows on the thorn by the wayside,
Black, yet how softly they gleamed beneath the brown shade of her tresses."

The reading continued while the stage became dark, allowing the first little statue to slip out through the back of the curtain, and then in a moment a rose circle of light fell upon the happy betrothal scene of Evangeline and Gabriel.

Color Tone Given to Scenes

And so the various pictures were given the proper tone through the use of different colored lights, thus bringing out the child's own interpretation of the lines through the use of color. That color can give the correct atmosphere to any stage scene has for some time been an accepted fact, but an elaborate stage setting has generally been thought necessary to bring out the effect. This simple schoolhouse production, on the other hand, demonstrated the fact that the use of colored light is as effective in producing the atmosphere of a scene as an expensive stage setting.

It was, in reality, a demonstration of Belasco's theory that the art of stage setting is still in its infancy simply because the art of stage lighting is still in its infancy. This master of stage craft predicts that in time all settings will be produced through the use of lights to the exclusion of other scenery and that the effect so produced will be more pleasing than any which have been obtained through the use of today's method of stagecraft. It truly seems that there can be no limit to the field of interior illumination.

The third tableau, which appeared in a circle of soft blue-green light, illustrated the lines which follow the scene of the betrothal:

"Meanwhile apart, in the twilight gloom of a window's embrasure,
Sat the lovers, and whispered together, beholding the moon rise
Over the pallid sea and the silvery mist of the meadows."

And then, after the brief period of darkness which served as well as any curtain in allowing the small actors to change places, the fourth picture appeared

In the first scene of this group where Evangeline is asking advice from the magic Indian woman, the effect of a camp fire was obtained by placing a red mazda lamp under some paper and among the camp fire sticks. The parting of Evangeline from Gabriel's father and from her Indian friends as she goes onward in her search is shown in the next tableau, while the final union of the two lovers, which was presented in a soft circle of lavender light, interpreted the last lines of the poem.

in a circle of lavender light. This showed the parting of the two lovers of Arcadia, brought about by the tragic deportation of its French settlers by the English military forces in early Colonial times.

After this, the outstanding points of Evangeline's wanderings in search of her lover were presented in the four scenes following. In the third tableau of this group, which showed Evangeline relating her tale of love to the Shawnee Indian woman, the necessary campfire was effected by a couple of red electric globes burning under some white paper among regulation campfire sticks.

The American Boy and Electricity

This sort of contrivance seems, of course, very simple to those beyond the walls of the eighth grade, but to the boy under sixteen, the arranging of such an electrical campfire is fascinating. In fact, the young director found that the interest of the small boys was increased one hundred per cent when the electrical idea came into the production. The American boy seems to feel with a strange intuition that he is to live in the great electrical age, for there is hardly a lad today whose interest cannot be captured immediately by any sort of electrical apparatus.

And so in working up this Evangeline entertainment, it could be seen that the small boys found the tableaux worthy of their attention as soon as they realized that a large part of their success was to depend on the use of electricity. If the boy under sixteen becomes a "booster" of electricity, he will not only talk the electrical itea at home but will certainly be a staunch supporter of the electrical idea during the coming forty or fifty years.

The last tableau of the Evangeline entertainment appeared in a circle of lavender light. It pictured the reunion of Evangeline and Gabriel at the death-bed of the latter.

"All was ended now, the hope, and the fear and the sorrow,
All the aching of heart, the restless, unsatisfied longing,
All the dull, deep pain, the constant anguish of patience!
And, as she pressed once more the lifeless head to her bosom,
Meekly she bowed her own, and murmured, 'Father, I thank Thee!' "

A Finished Production

Then the interpreter appeared again in the light at the center of the stage and read the conclusion of the poem. When the lights went on, children, teachers and visitors, all recognized that this school-house entertainment had the marks of a finished production. And furthermore, they realized that the finished and complete effect had been made possible through the use of electricity.

The School Entertainment of the Future

The work of these school children combined with that of the co-workers from the General Electric Company really opened the way for the extensive use of electricity in the production of school entertainments. It showed how the child's imagination can be developed in this way, since it is spurred on through the effective productions which electricity makes possible.

There are numerous ways in which the tableau can be used in impressing particular facts upon the child's mind. For example, the music teacher will find song tableaux valuable in creating interest in the songs she is teaching, because a picture which is typical of a certain song can be effectively presented as a tableau while the song is being played or sung behind the scenes. For example, appropriate tableaux which have been presented to illustrate "America" will be remembered by the child whenever the tune is played or sung, and so he will always visualize the idea for which the song stands.

Electricity and the Dancing Production

In a Kermess given recently by the girls of Mills College various other inexpensive yet effective ways in which electricity can be used in improving this sort of an entertainment were shown. In a Fire-fly dance the desired effect was produced through the use of little hand flashlights in the hands of the dancers. These were made to flicker in real fire-fly fashion as the blue figures danced here and there on the dimly lighted stage.

From the foregoing uses which have been made of electricity in certain school productions, the teacher and the electrical man should realize that wherever there is an effect to produce, that effect can be increased one hundred per cent through the application of electricity. Furthermore, the men of the electrical industry who realize the value of increasing the school-house consumption of electricity should see that not only can this consumption be increased through the school entertainment, but also that in this way they can best appeal to the child so as to capitalize that electrical interest which lies latent in the mind of every coming American.

ELECTRICAL DEVELOPMENT IN CHINA

There are only 168 electrical undertakings in China, 49 of which are under foreign management. The Japanese have invested over $100,000,000 in such enterprises through the South Manchurian Railway Company, and $759,000 through other concerns; and the British have invested $25,000,000, of which about half is through Chinese concerns. In Canton there are 22 power and light companies in addition to the British Tramway Company. No water power is used, most of the power being derived from oil, except for the two coal-burning plants. They are all small, only four having a capacity of over 1,000 kw. There are also 22 electrical enterprises in Kiangsu Province, centered around the city of Shanghai, which develop twice the powers of the Canton plants. All of them use steam power. Of the 15 electrical companies in Shengking Province, Manchuria, 13 are managed and owned by the Japanese, and the 30,000 kilowatts of power generated are supplied to Chino-Japanese industry or transportation enterprises. The largest single enterprise is the No. 1 Power House of the railway company, which generates 4,500 kw. by steam. Although Shantung Province is one of the most populous areas in China there are but four Chinese and one Japanese plants, generating a total of but 5,000 kw. In the other Provinces there are only the small native plants using gas power and operating on a very small scale.

Office Records—Their Filing and Indexing

BY IRENE WARREN

(In this eleventh of the series of articles by the Director of the Chicago School of Filing and Indexing, the author summarizes the various problems of supervision and administration which must be solved in putting the filing department upon an efficient working basis. A unique system of preparing a daily statistical report of the department is explained and illustrated. —The Editor.)

PROBLEMS OF SUPERVISION AND ADMINISTRATION

When we reduce the many filing systems on the market down their basic principles, we find that they all are planned to classify the various kinds of materials:—

1. By the name of the individual, firm, or item.
2. By the location.
3. By the subject.

So far, we have discovered only four practical methods of arrangement:—

1. By the alphabet (which is used most generally).
2. By numbers—consecutive numbers or decimals.
3. By dates.
4. By a color scheme.

There are very few systems that are pure types of any one of these arrangements; most of them are combinations of two or more of them. Manufacturers frequently have introduced various devices which have little value and are confusing to both operator and user. The best filing systems are the simplest in construction, and are those absolutely free from any devices, lettering or numbers not essential to the operator or user.

Problems of the File Clerk

But the installation and management of a filing system is not always as simple as this might indicate. The arrangement by location becomes a complicated problem in a telephone company, for instance, when it means a list of streets divided by east and west, north and south, in which buildings are numbered and where the rooms within the large buildings run into the hundreds. It may take great ingenuity for even an expert file clerk to set up the files for the claim department in a transportation company which may control fifty or more lines—possibly a dozen or more of them running into the same city—since these claims may be referred to by agents shipping or receiving, by the order or shipping number, or by the name of consignee or consignor, and information must be given regarding the movement of shipments over the various roads as well.

This means knowing the given business well and understanding thoroughly the three classifications with the four methods for obtaining these arrangements as cited above, and the best equpiment, and then adapting these to the definite problem in hand.

The file clerk then considers:

1. How much of the information needed can be concentrated in one record to advantage.
2. How much of this record should be duplicated and either arranged according to another method, or sent to other departments for use.
3. Whether these files may be made to index themselves, or if card indexes are needed to supplement them.

Usually the file clerk is directly responsible to the office manager, and it is extremely important that the latter should have a good appreciation, if not actual knowledge, of the basic principles of filing and indexing and the more important administrative questions involved. Most important among these is the right relation of the filing department to the other departments in the corporation and the enforcement of the regulations that materials for filing shall be sent promptly to the filing department and kept there during such time as they are not in actual use.

When a new record is to be made in any of the departments, the file clerk ought to be consulted to see that the information isn't already in some record in use in another department; and also, that he may advise about the best form for the record. If a department will clearly state the results it wishes to obtain, carefully assemble the necessary data, or indicate what these are, and work the problem out with their own file clerk (provided he is competent and well trained), there will seldom be need for calling in outside experts. Too great stress cannot be laid on the points of choosing the well trained file executive, having the office manager thoroughly in sympathy with the filing department; and at every turn helping place it in right relation with the other departments.

Equipment and Management

Service is the keynote of the modern filing department and the location of this department within the firm must be such as to ensure economical service to the various departments needing it. Anything but the best equipment is poor economy for this department. A few dollars spent in the best furniture, supplies and devices save much wasted human effort. An elaborate equipment is unnecessary, but constant, careful attention to the selection of time-saving and labor-saving equipment will reduce the waste in the daily routine. This takes the wisest kind of supervision.

Some of the most obviously bad conditions regarding equipment and management which thousands of file clerks are struggling with today, that are keeping executives from getting the papers from the files instantly when needed, and which could be remedied so easily, might be listed as follows:

1. Drawers in cabinets are too full to permit accurate, rapid filing.
2. Poor system of guiding—guides too complicated in plan, not evenly distributed and not enough in a drawer. There should be from twenty-five to forty guides in a drawer.
3. Folders of such poor material that tabs break down.
4. Too many letters in a folder.
5. Name on folder is not written in the form in which it is to be filed.

1920 APRIL.	CORRESPONDENCE			ORIGINAL ORDERS			SHIPPING ORDERS			INVOICES FILED	HOLD FOR ANSWER		ADVERTIZ. REQUIZ. RECEIVED	CREDIT MEMOS. FILED	REMITTANCES FILED	TOTAL PAPERS HANDLED	CLERKS PRESENT	ADD'TL. SERVICE OUTSIDE DEPT.
	FILED	CHARGED	REFILED	FILED	CHARGED	REFILED	FILED	CHARGED	REFILED		INCOMING	OUTGOING						
1	400	80	306	302	94	42	847	77	52	924	17	18	135	132	130	3,556	12	
2	327	55	335	311	107	45	1,196	102	64	1,127	38	19	60	89	1	3,876	12	
3	494	38	212	695	30	11	381	25	97	1,568	35	73	53	—	145	3,857	12	
4																		
5	252	108	158	753	163	104	127	178	83	2,072	58	9	126	84	128	4,450	12	
6	408	122	130	240	125	66	29	171	42	—	51	20	42	559	192	2,041	13	
7	403	73	31	421	127	497	417	154	35	2	41	18	1	1	223	2,449	13	
8	606	90	28	298	164	919	592	88	64	—	46	21	175	—	187	3,075	12	
9	299	285	54	154	623	64	208	179	134	1	53	27	—	—	278	2,666	12	
10	86	75	10	—	96	440	719	34	43	—	9	42	11	5	190	1,760	12	
11																		
12	252	96	21	261	183	1,246	819	196	15	1	34	52	8	215	291	3,690	12	
13	435	82	30	574	53	912	1,059	84	50	1,317	86	10	121	—	706	5,519	13	
14	591	58	39	194	143	276	589	83	48	2,109	23	32	35	—	715	4,935	15	
15	220	73	21	438	83	504	1,862	67	44	735	43	28	70	—	280	5,218	16	750
16	657	72	65	510	93	103	937	59	45	1,895	64	22	175	—	316	6,063	13	1,050
17	403	40	42	242	60	76	318	22	32	1,735	26	49	7	—	156	3,707	14	500
18																		
19	178	70	133	5	105	50	7	90	25	597	42	40	20	—	486	2,588	13	750
20	485	76	48	605	84	162	1,139	77	28	1,130	20	34	160	3	321	7,892	14	3,520
21	877	197	203	183	15	65	821	58	114	2,344	75	15	—	—	333	8,167	14	2,867
22	338	73	46	909	91	465	760	57	69	1,325	56	21	—	—	219	8,883	15	4,454
23	840	70	7	341	89	1,110	1,429	70	80	2,485	80	15	169	—	306	10,253	15	3,162
24	314	44	—	277	55	321	227	26	20	720	55	29	—	—	83	2,171	15	—
25																		
26	223	85	27	145	140	1,449	1,180	88	68	2,019	31	—	215	—	178	6,742	13	1,860
27	529	92	—	419	61	2,347	173	131	131	1,266	31	24	11	—	472	8,670	15	1,976
28	811	86	7	524	72	2,580	1,279	69	35	1,285	24	27	33	—	152	6,488	15	610
29	491	75	—	337	20	2,632	276	37	32	1,577	73	15	114	—	371	7,703	16	650
30	596	66	17	434	26	1,630	214	69	55	1,434	73	27	78	—	99	7,568	14	2,688
TOTALS	12,515	2,281	1,970	9,572	2,902	18,116	17,605	2,281	1,505	29,668	1,184	687	1,819	1,088	6,858	GRAND TOTAL 133,988	352	24,837
AVERAGES	520.6+	95.0+	82.1—	398.8+	120.9+	754.8+	733.5+	95.0+	62.7+	1,236.2+	49.3+	28.6+	75.8—	45.3+	285.7+	5,582.8+	14.7	1,034.9+

Total number papers handled during March..... 86,986
" " " " " April 133,988
Percentage of increase for month..... 54.0+%
" " " over April, 1919..... (Have no statistics)
Average no. papers handled per day in March..... 3,221.7+
" " " " " " " April ..... 5,582.8+
" " " " " " per clerk in March..... 309.7+
" " " " " " " " April ..... 379.7+
Average attendance of clerks per day..... 14.7+
Percentage of attendance of clerks for month..... 93.3+%

Specimen of monthly statistical report of filing department.

6. If more than one file is kept, failure to stamp each item with the name of the file where the item belongs.
7. Letters not marked properly for filing.
8. Misspelling of names by stenographers not carefully checked, either before or after letters get to the filing department.
9. Members of different departments pin papers together for temporary use and they get into the files that way.
10. No charging system for papers taken from the files.
11. No adequate follow-up system.
12. Transfer of correspondence not made at stated intervals.
13. No regulations for those using the files.
14. Letters are held in individuals' desks either carelessly or because they are wanted at some future date.

Personnel of the Department

In most firms, it is necessary to give considerable attention to the personnel of the filing department. Stenographers, typists, and general office workers often tell the file clerks that they think filing beneath them; that it is underpaid, monotonous work, with no future to it. The executive file clerk will do well to hold a weekly conference with his staff, and point by point take up the objections to filing. He has also the opportunity to prove that the work of the filing department may be so distributed that it is extremely interesting to the workers and that there is no room in the department for the worker who will not **think.** "Thinking jobs" usually receive their financial reward and give opportunity for the worker's advancement. Executives are seeing that the filing department is the best place for employes to learn the business, and are starting all clerical workers there. With the research or library department as its direct goal and many of the other departments as possible avenues for advancement, the alert file clerk should feel no serious limitations.

Value of Filing Department Report

Many office managers object to the overhead expense of a well organized filing department. Their information is very indefinite regarding the volume of work done in the department, the overturn of employes, and the value of the work to the firm. Miss J. Grace Thompson, the file executive for the Wahl Company, has prepared a statistical report for each day. Once a month, she submits to her manager a report showing daily records with averages and percentages of increase of material handled in the central filing department. From this chart, the company sees at a glance the actual amount of finished business for the month given in terms of filed papers.

An interesting feature shown by the report is the increased amount of material handled, requiring more clerks, but each clerk handled seventy more papers in a day over the previous month's record, a demonstrated increase in efficiency.

INTER-COMMUNICATING TELEPHONE

The managers of some of the larger motion picture theaters have found the inter-communicating telephone a great efficiency factor in their work. Countless times during the performance the manager has occasion to communicate with the box office, operative both, floor captains, orchestra pit, music room, electrician and doorman. It has been found that a system by which the pressure of a single button gives almost immediate connection with the desired party, saves endless steps, valuable time, and makes top-notch service possible.

The Man in the Company

BY A. B. WOLLABER

(At this time, when the expansion of the electric utilities of the West is proceeding at such a rapid rate, it is of the greatest importance carefully to study the principles underlying this substantial growth. This article by A. B. Wollaber, district agent of Southern California Edison Company, is the first of two covering this important subject.—The Editor.)

Service has ever been the watchword of the electrical industry and it is one of the corner-stones upon which all utility companies are built. The rendering of service to the public consists not only of the supplying of the product of the company but also largely the conscientious, considerate manner in which the employes of the companies, from the managers down, deal with the public.

Recently the president of the National Electric Light Association adopted as a slogan the words "Service before profit." Let us stop for a moment and consider the meaning of these words not only as applied to the industry, but to the individual worker in the industry. Service, briefly defined, consists in giving an equivalent for an equivalent, while profit may be briefly referred to as gain, benefit or advantage. In considering this subject from the standpoint of the individual worker and not particularly the company, the above slogan is changed to say that the individual worker has a right to adopt for his motto, "Service **with** profit." Profit not only to his company and to the public whom he serves, but profit to himself. The question to be considered by all of us is what this profit is going to be. Is it to be measured in dollars and cents? Or are we going to take another and broader view of the meaning of these words and learn that our services and those of our company cannot be entirely measured on a dollar and cent basis, but as a service we ought rightfully to give with profit to ourselves and to the community we serve. These conditions are necessary to the successful carrying on of any enterprise, and in the electrical industry the standard is set high.

It was Carlyle who said that "no man can exist apart from his circumstances; these must in any case be the field of his effort and in great measure, must determine the means which he uses, and the end he proposes to reach."

Electrical workers, what are your circumstances? I will answer for you and say they are largely what you make them.

Are you a time server and a clock watcher in the industry, content with eight hours of work, or are you an honest, earnest worker in the ranks, looking for something better, striving to enter in, and to mount the ladder of success, round by round? If the latter—then the industry is possessed of the right kind of a worker and the community you serve is bound to get the right impression of the industry which we are all so proud to represent. If the former, then I say, you are wasting your time and it were better for you that you separate yourself from the industry than to go on "getting by" and creating for yourself and for your company a condition which is a liability to both.

How often you hear it said that So-and-So owes his advancement in any organization to certain pull that he has with the management and certain individuals there are in all organizations who, blinded by their own shortcomings, cannot conceive how another can advance without some sort of stand-in with those in authority. Those who stand on the side lines in a football game, cheering their favorite team to victory, are not the ones who really win the game. Their encouragement may aid the morale of their particular favorite but their cheers aid little in the final outcome of the battle. Are you in the game fighting to win for your company and for yourself, or are you standing on the side line, shouting not always words of encouragement to your fellow workers but complaining, backbiting and finding fault, with the attending evils that result from such an attitude. It is well to think of these things and to think of them seriously, for the time has come in all lines of business when men are needed more than ever before. Not merely numerical forces, but workers of the right sort; loyal, conscientious and faithful workers, and for this end we serve.

To confine the consideration of this very large subject to a proper length, it has been deemed best to consider it from the angle of those employes who more often meet the public. In most electric utility companies they are, first, the district manager; second, the chief clerk; third, the district foreman; and in the fourth class, for convenience, we may place all other employes.

To the District Manager

The manager of any business, general or local, is the corner-stone upon which this business is constructed. The district manager may, therefore, properly be considered as the corner-stone upon which rests the whole structure of the district organization. In order that this structure may stand, this corner-stone must be selected carefully. It cannot be "the stone rejected of the builders" but must be symmetrical and true if the organization is to withstand the vicissitudes of time and the battles that are constantly going on round about it.

There is nothing that adds more to the successful administration of any business than confidence, and if a representative of a company has the confidence of its officers and also the confidence and respect of those serving under him he has taken a long stride along the road of successful administration. Are you taking your office force into your confidence and making them feel that they are a part the organization they represent? Upon returning from meetings with the officials of your company, do you call your force together and give those not fortunate enough to attend, the benefit of what you yourself have learned? If not, you are withholding from those under you a part of the profit they have a right to expect and depriving them of an oppor-

tunity to gain in knowledge through your more fortunate contact with those in authority.

What disposition are you making of the many publications sent you by the company? Do you read them yourself and then pass them along to your force, calling attention to this or that article that would directly improve the condition of your employes? Or are these publications filed away in your office to collect dust and dirt without doing others any good? This is a part of the profit you receive from the company and which will, if carefully considered, fit those under you for positions of trust with the attendant increase in salary such positions warrant.

Are you as quick to commend good work in your employes as you are to censure them for failure to do their duty? One is quite as essential as the other. We are all human beings and a little well-merited praise costs little and goes a long way toward returning a profit on the investment. Are you careful to watch the effect your employes and your office are having on the public? Remember, it is at your counter that this ever present body gains almost its entire impression of your organization. Are you careful to see that this impression is of the right sort? I recall several instances which in my career stand out boldly as examples of what is meant by this question, and will illustrate the point I am endeavoring to drive home. These all occurred in the office of a large utility company doing business in the West.

An official of this company put in a call on the telephone and asked for the local manager. When he received the connection the first question he asked was, "Who answered my call?" He was informed that it was a young lady temporarily employed during the absence of the regular operator. Quick as a flash came the reply from this official, "Make her a permanent employe; we need just such persons in this company." She received her reward and the company had benefited by getting an employe who was capable of giving a good impression to the public.

The next instance was that of a newspaper editor who had constantly fought the company and who was never known to come to the office, notwithstanding he was apparently on friendly terms with the local representative. Later the company built a new office in the community and this editor was induced, among others, to call and inspect it. He did not say a great deal on his first visit, probably because all newspaper editors are supposed to be more or less profound and distant, but it was noticed that he came back again in a few days and this was what he said to the local manager: "I like to come into this office because there is such an atmosphere of good feeling and efficiency; it fairly smiles on you, and when a fellow gets in here he hates to leave."

The final example is a rather sad one but one we meet with almost daily in our dealings with various lines of business. The local manager once met one of his good customers and in the course of conversation was asked this question: "Where did you get that clerk you have in your front office?" He was informed that he was an old employe of the company and one who was regularly employed in meeting the public. The manager then asked the customer just why he had made the inquiry; he replied, "Well, he always has an expression on his face which seems to say to me, 'I wish you wouldn't come in here and bother me about the payment of your bills.'" Of course, this employe did not wish to create such an impression, but the consumer got that feeling from his attitude which proved without doubt that he was holding a position for which he was not fitted and thereby creating an unfavorable impression for his company. How many good pieces of business have been lost by a thoughtless word or a wrong impression, and many times municipal ownership agitation started by carelessness in representing the company to its consumers! At no time in our history have conditions been more unsettled than at present. This being the case it behooves all to watch, look and listen in order that they may not be found wanting when the test of their ability comes.

ELECTRICAL CONTRACTOR-DEALER

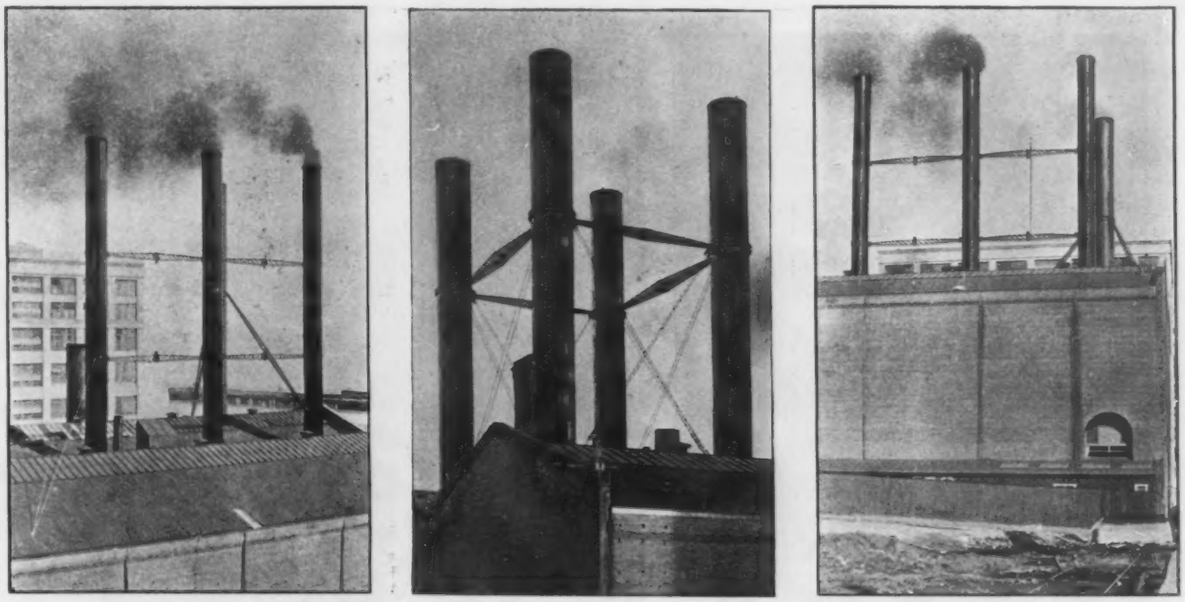
BY J. H. SROUFE

There are three cardinal features that a first-class electrical contractor-dealer must possess in order that he may conduct his business along legitimate lines and make a profit. First, he must be a salesman of no mean abilities. Second, he must possess executive ability. Third, he must be able to make quick, definite and correct decisions.

Today, as we emerge from the price cutting fights of the past, we find that a good salesman is the man who gets the business. He understands what he is selling and knows its worth. It is he who can combine all the features of the job into one and show the customer just what he is buying, be it a socket device or a contract that runs into thousands of dollars. He is a speaker, and talks on a subject that he knows all about in a quick and decisive manner. He can convince the customer that he needs and wants to buy the article up for sale, and he is able to take away from the customer's mind any idea that he is not getting the very thing he wants. A good salesman will not sell a man anything he knows the customer does not want.

An electrical contractor-dealer may be ever so good as a salesman, yet if he does not possess that absolute necessity, called executive ability, his business is sure to go to ruin. Executive ability means the surrounding one's self with the very best of organized plans for executing jobs as they are landed. The good electrical contractor-dealer executive will have a method of executing his work whereby he knows that his job is not running over the estimated cost.

Decision is an essential characteristic of any successful business man. Many a good business has been ruined because of the lack of quick decision. The contractor-dealer should be trained to decide correctly on every question, and when once he exemplifies his ability to decide aright on important problems, his business will progress.



Stacks of Sta. A, Pacific Gas & Electric Co., San Francisco. This plant is one of the largest fuel oil operated power plants in the world. The first view shows improper cumbustion; the second proper cumbustion; the third, instances of proper and improper combustion in varying degrees.

Fuel Oil Burning Appliances

BY ROBERT SIBLEY AND C. H. DELANY

(How to get the greatest energy producing value out of the steam electric plant, oil fired, is a problem of vital interest in these days of decreasing production in fuel oil and increasing cost of the product. A clear understanding of fuel oil burning appliances used in the power plant house is a great aid in solving this problem. Here is an article that treats of storage tanks, measurement of oil, and oil pumps, by the authors of the well-known book on "Fuel Oil and Steam Engineering." This data should prove of great timely helpfulness throughout the West and in countries bordering the Pacific, wherever oil is used as fuel.—The Editor.)

In its course from the point of delivery at the plant to the burners the oil must pass through a number of appliances, which are necessary for the complete equipment of any oil burning plant. In this discussion we shall follow the oil in its journey through the plant and describe briefly the various appliances required for handling it.

Oil may be delivered at the plant either by rail in tank cars or by water in barges or tank steamers specially constructed for the purpose. From these it is pumped into large storage tanks, which may be of either concrete or steel.

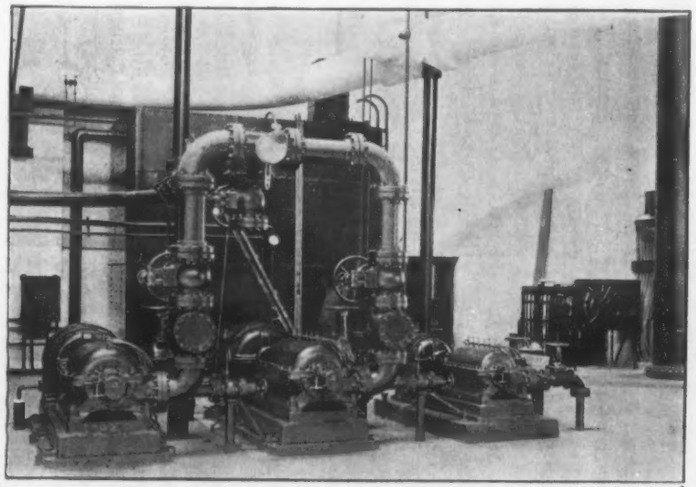
Storage Tanks.—For power plants large cylindrical steel storage tanks are used. These are usually set on the ground outside the plant and are built in any desired size up to 50,000 barrels capacity. They are built up of riveted steel plates, the thickness of plate and strength of riveted joint being proportioned in accordance with the usual safety rules based on the internal pressure due to the head of oil inside the tank. Thus if the tank is 30 feet high the internal pressure will be that due to 30 feet head of oil or approximately 15 lbs. per square inch. It is customary to surround the storage tank by a concrete wall about 6 feet high far enough away from the tank so that the entire contents of the tank will be held in by the wall in case of a leak in the tank. This is to prevent the oil from leaking out to the surrounding country.

The size of storage tank required depends on two factors:

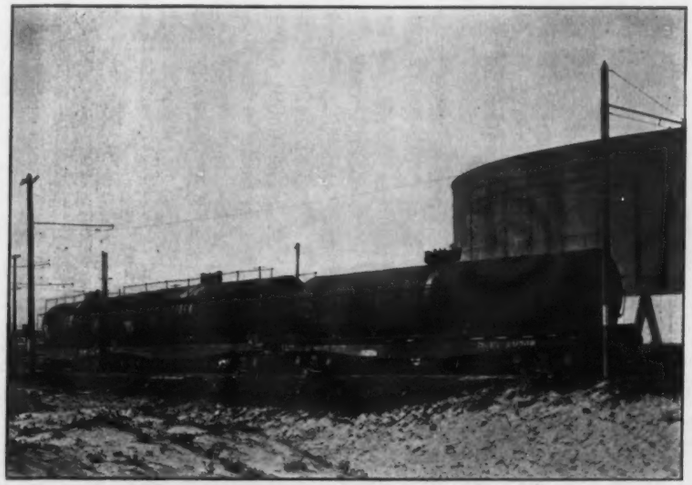
1. Quantity of oil to be burned.
2. Availability of oil supply.

This second factor depends on the location of plant, the method of delivery, and the probability of interruptions in delivery, all of which matters must be carefully considered in determining the number of days' oil supply that should be carried at the plant. Most power plants are provided with tanks of sufficient size to enable them to keep from ten to thirty days' supply of oil on hand. This storage capacity should preferably be divided among two or more tanks rather than all concentrated in a single tank, as this will enable one tank to be emptied for cleaning and repairs without shutting down the entire plant.

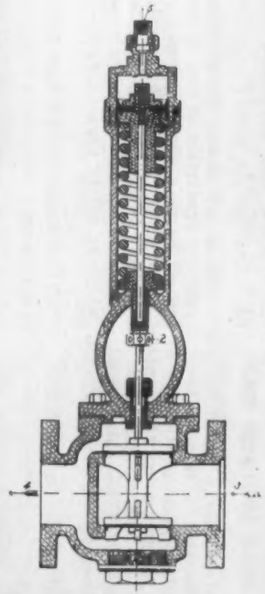
In built up districts within the fire limits of cities it is not permissible to locate the storage tanks above ground. The National Board of Fire Underwriters have adopted certain rules for the location of oil storage tanks. Similar rules have been adopted by several cities. In general these rules provide that within the fire limits of cities the tank must be located so that its top is at least 3 feet below the level of the fire room floor and below the lowest pipe in the building to be supplied. The tank most be set on a firm foundation and covered with soft earth or



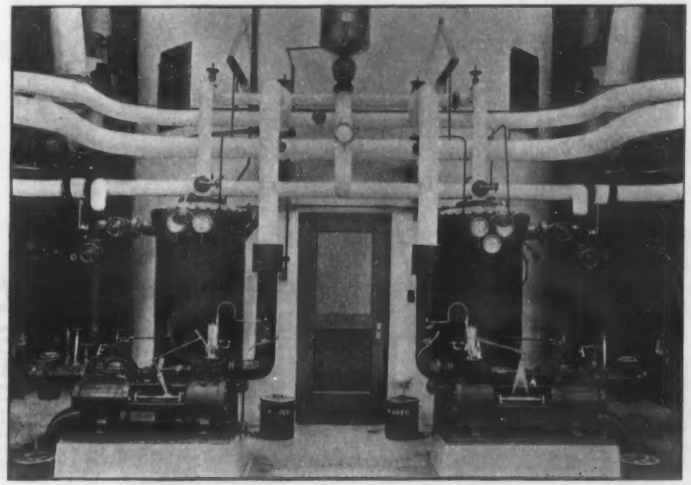
Auxiliary apparatus, turbo driven, at the Long Beach Plant of the Southern California Edison Company



The cars are shown on the unloading track of the Redondo Steam Plant of the Southern California Edison Company, and the oil is emptied from them into the flume which runs beside the tank; thence it goes into a small underground tank from which it is pumped into the main storage tank.

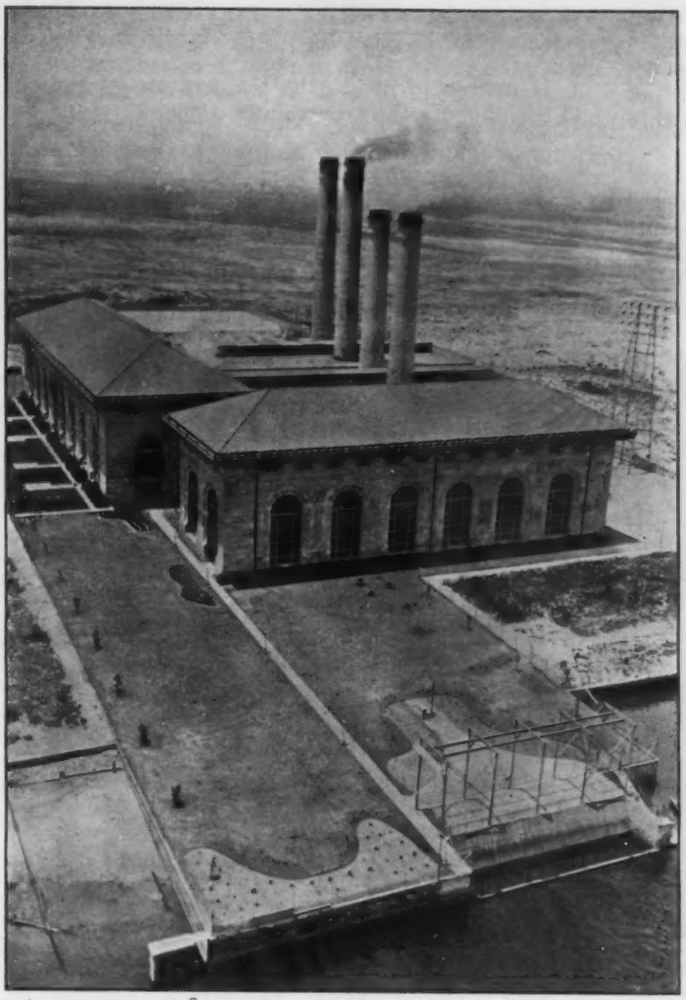


The Witt Pump Governor. It controls the running of a pump and will hold a steady pressure on the discharge line.

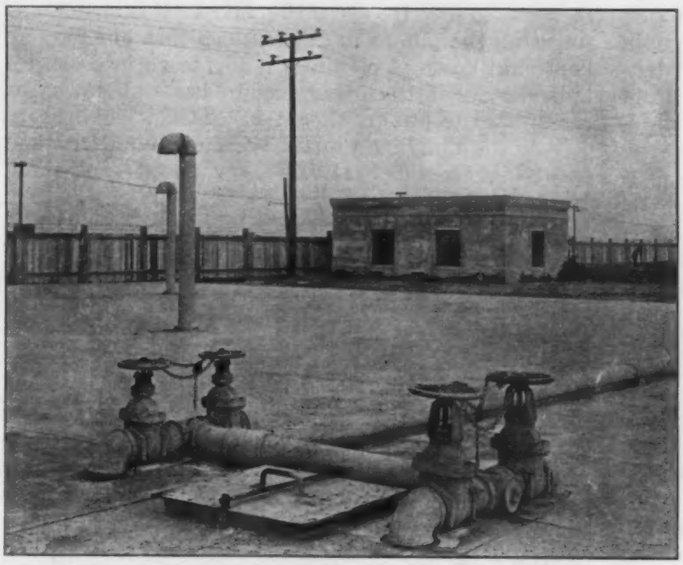


Fuel oil pumps for turbine No. 3 at the Long Beach Plant of the Southern California Edison Company. Note the neat and attractive appearance throughout in this interesting installation, quite typical where oil is used as fuel.

Main oil storage tank at Station C, Pacific Gas & Electric Company, Oakland, California. Tank in foreground is set low for fire protection purposes while tank in rear is surrounded by concrete retaining wall.



Exterior view, Long Beach Plant, Southern California Edison Company. This plant is noted for its use of meters, for various sorts of economy studies and for records obtained in daily operating practice. Note the finish and aesthetic beauty of the exterior.



A close up view of the filling pipes for the oil storage reservoirs of the Southern California Edison Company's Long Beach Plant. These valves are under control of the oil company from whom the oil is purchased.

sand, no air space being allowed immediately outside the tank.

Every oil storage tank must be provided with the following attachments: Filling pipe, suction pipe, vent pipe, smothering pipe, overflow pipe, and measuring rod or chain.

For tanks less than 1000 gallons capacity the filling pipe and vent pipe may be on the same connection. For larger tanks separate connections are required. The vent pipe must extend from the top of the tank to a point outside the building at least 12 feet above the top of the highest tank car from which the storage tank may be filled. All outlets on the tank should be located on top, the suction pipe running down inside the tank to near the bottom. The smothering pipe consists of a small steam pipe through which steam can be blown in case of fire, thus keeping air away and effectually smothering the flames. The overflow pipe is arranged to carry back to the storage tank all oil not used. An automatic relief valve is provided on the oil pump discharge set to open at a predetermined pressure, and discharging through the overflow pipe back to the storage tank. All pipes should be run as direct as possible and pitched toward the storage tank. The oil in the tank may be measured by means of a rod or chain let down through the top of the tank. The use of gauge glasses should be avoided as they are liable to break, causing leakage of oil.

Many power plants are provided with a service tank located under the fireroom floor in addition to the main storage tank outside the building . The service tank is filled at intervals from the storage tank, and the oil pumps take their supply from the service tank and distribute it to the oil burners.

Measurement of Oil.—Oil is ordinarily measured by passing a rod or chain down through the top of the storage tank, the rod being marked off in feet, inches and fractions of an inch. By sounding to the bottom of the tank, the depth of oil can be determined very accurately. A more convenient method, though not quite so accurate, is to use a float with a chain passing over a pulley at the top of the tank, the outer end having a pointer which indicates the height of oil in the tank on a suitably calibrated scale. The height of oil in the tank may also be determined by an indicating or recording pressure gauge, which depends for its operation on the hydrostatic pressure produced by the oil.

After determining the height of oil in the tank it is necessary to convert the measurement into gallons or barrels of oil. To do this it is necessary to carefully calibrate the tank either by pumping into its known quantities of oil, or by taking careful measurements and calculating its contents. This latter method is very simple if the tank has

vertical sides. If, however a cylindrical tank lying horizontally is used, the calculation is somewhat complicated. The attached table giving the capacity of horizontal cylindrical tanks per foot of length for various depths of liquid will be of assistance in this connection.

After determining the volume of oil in a tank it is necessary to make correction for its temperature, for, like everything else, oil expands and contracts with changes of temperature and the volume measured at one temperature will not be the same as the volume of the same weight of oil at another temperature. The amount of variation of the volume of the oil depends on its coefficient of expansion. The coefficient of expansion varies for different oils, but the average value for California oils is usually taken at 0.0004 for each degree Fahrenheit change in temperature; that is, the oil expands four ten-thousandths of its volume for each degree F. rise in temperature. This is equivalent to 0.00072 per degree Centigrade.

In practice 60° F. has been adopted as the standard temperature and to reduce the measured volume to the true volume at 60° F. the following formula is used:

$$V_{60} = \frac{Vt}{1 + ((t - 60) \times .0004)}$$

where V = the volume of oil at 60° F.

Vt = the volume of oil as measured, both expressed in barrels, gallons or cubic feet as the case may be.

t = temperature of the oil when measured, in degrees F.

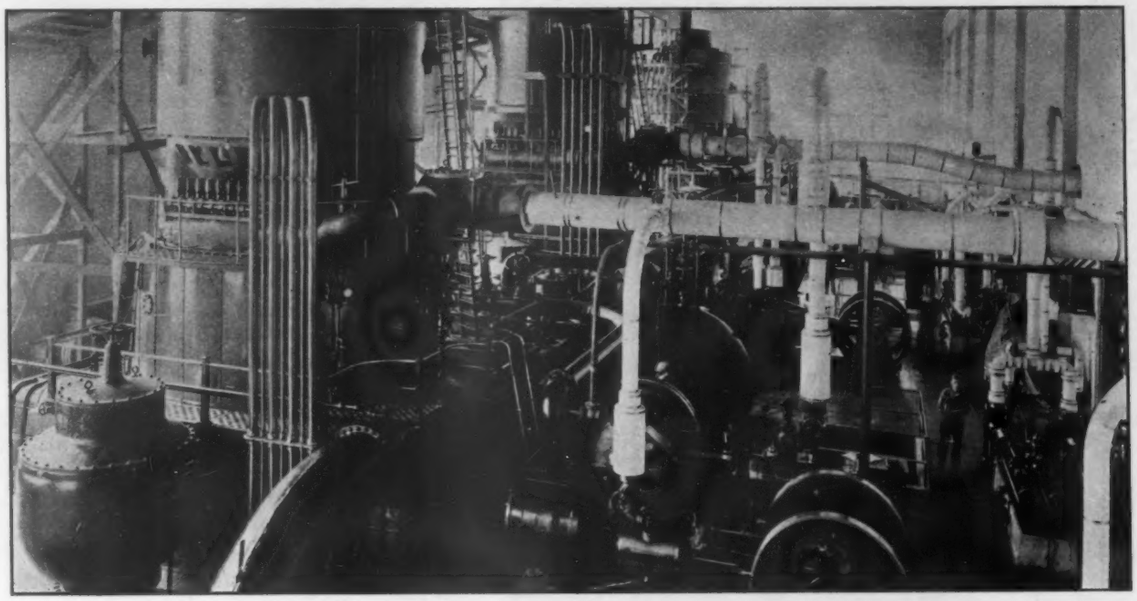
Thus if the soundings in a tank before and after filling show that 960 barrels have been added, and the observed temperature of the oil was 80° F., then the volume at 60° F.

$$V_{60} = \frac{960}{1 + (20 \times .0004)} = 952 \text{ barrels.}$$

If instead of 80° F. the temperature of the oil had been 50° F., the true volume at 60° F. would be

$$V_{60} = \frac{960}{1 + (-10 \times .0004)} = 964 \text{ barrels}$$

Oil Pumps.—The oil is taken from the supply tank by the oil pump. The type of pump ordinarily used for this purpose is the ordinary duplex steam driven reciprocating pump. The pump must have brass valves, and packing that will not be affected by the oil. The pump should be provided with a large air chamber to prevent pulsation of oil pressure due to the strokes of the pump. It is customary to install the pumps in duplicate so that one may be kept shut down at all times ready to go into service immediately if the other has to be shut down for repairs. The pumps should be of sufficient size to deliver the maximum quantity of oil required when operating at comparatively slow speed—not more



Interior view of Generating Room, Long Beach Plant of Southern California Edison Company. This is one of the largest fuel oil steam generating power plants in the world.

Table of Capacity in Gallons of Cylindrical Tanks per Foot in Length Laying Horizontally

Diam. of Tank	Depth of Liquid																					
	6"	1'-0	1'-6	2'-0	2'-6	3'-0	3'-6	4'-0	4'-6	5'-0	5'-6	6'-0	6'-6	7'-0	7'-6	8'-0	8'-6	9'-0	9'-6	10'-0
6"	1.96																			
1'-0	2.94	5.80																		
1'-6	3.85	9.36	13.22																	
2'-0	4.60	11.75	18.85	23.56																
2'-6	5.22	13.71	23.02	30.99	36.73															
3'-0	5.81	15.41	26.40	37.47	47.05	52.88														
3'-6	6.30	16.95	29.47	42.46	55.01	65.66	71.96													
4'-0	6.78	18.37	32.16	46.37	61.86	75.62	87.22	94.02												
4'-6	7.21	19.67	34.63	51.01	67.92	84.30	99.26	111.8	118.9											
5'-0	7.63	20.90	37.03	54.85	73.38	92.08	109.9	125.9	139.1	146.9										
5'-6	8.00	22.07	39.25	58.34	78.59	99.04	119.4	138.5	155.6	169.7	177.7									
6'-0	8.38	23.19	41.36	61.64	83.36	105.8	128.1	149.8	170.1	188.5	203.1	211.5								
6'-6	8.73	24.16	43.31	64.83	87.96	111.9	136.3	160.2	183.5	204.9	223.6	239.4	248.8							
7'-0	9.13	25.21	45.62	67.84	92.25	117.8	145.6	169.8	195.9	219.9	242.6	262.5	279.0	287.8						
7'-6	9.42	26.11	47.05	70.69	96.49	123.9	151.2	179.1	207.2	234.1	259.5	283.5	304.6	319.3	328.6					
8'-0	9.80	27.08	48.77	73.45	100.2	128.8	158.1	187.7	217.6	247.2	275.8	302.2	326.9	348.6	366.1	376.2				
8'-6	10.0	27.96	50.42	76.30	104.1	133.9	164.7	195.9	228.1	259.6	290.8	320.1	348.5	374.0	396.6	414.4	424.8			
9'-0	10.4	28.86	52.06	78.61	107.8	138.4	171.1	204.3	237.9	271.5	306.7	336.6	368.1	397.2	423.4	446.6	465.5	475.9		
9'-6	10.7	29.70	53.67	81.22	110.9	143.5	177.3	211.9	247.6	282.9	318.2	352.9	386.6	417.8	446.5	470.5	490.5	501.9	530.7	
10'-0	10.9	30.57	54.66	83.62	114.0	148.5	183.2	219.5	256.9	293.7	331.1	368.0	404.2	439.5	472.7	503.7	532.2	556.9	576.5	587.8

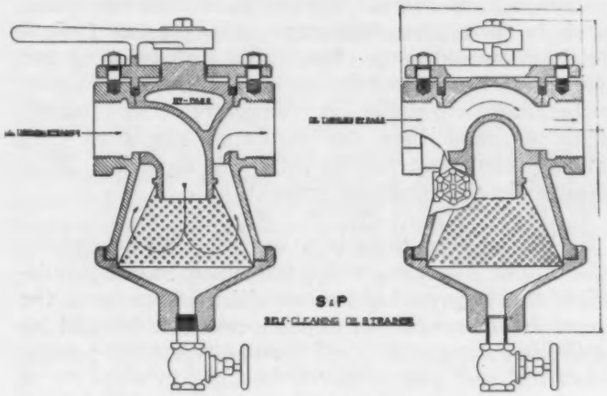
Example; Diam. of Tank 6'-0". Length of Tank 8'-0"
Depth of Water 5'-0"
From table, opposite 6'-0" and under 5'-0" the capacity per one foot in length is 146.9 gallons.
For 8'-0" in length, the capacity = 146.9 × 8 = 1175.2 gallons
For 5'-0" in length
One Foot in Length
Depth of Liquid

A simple table of capacity of horizontal cylindrical tanks per foot in length

than 15-20 strokes per minute. The pump must not be set too high above the oil tank, for oil cannot be raised by suction as high as water. The maximum suction lift permissible is about 16 feet.

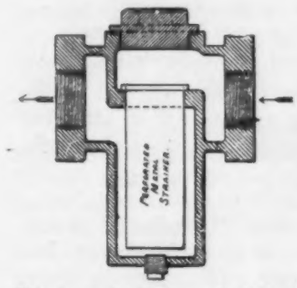
The oil pumps should be provided with a pump governor for the purpose of maintaining a steady oil pressure. An example of this is the Witt pump governor shown in the illustration. It consists of a double ported throttle valve placed on the steam line supplying the pump. The valve stem is attached to a spring loaded piston which is actuated by the oil pressure. If the oil pressure increases the valve partially closes, thus slowing down the pump. If the oil pressure drops the valve opens wider and the pump is speeded up. And predetermined pressure may thus be maintained by adjusting the spring.

Strainers.—Every oil burning plant must be provided with some form of strainer to remove the dirt and foreign matter which would be liable to

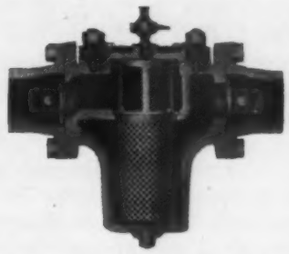


Staples and Pfeiffer Self Cleaning Oil Strainer

remove dirt and foreign matter which would be liable to cause stoppage of the burners. The strainer may be placed either in the suction line between the supply tank and the pump or in the discharge line after leaving the pump, or both. The strainer usually

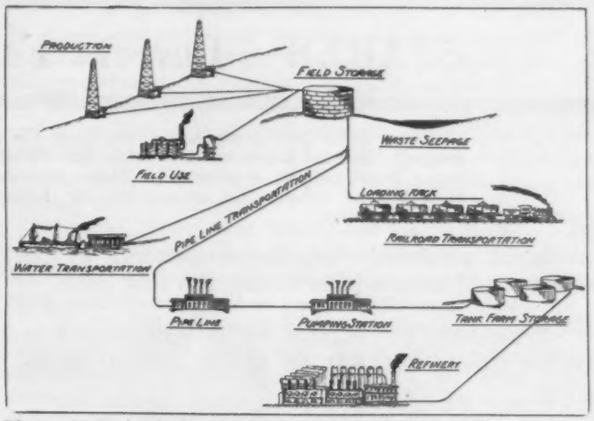


This is a simple form of strainer in which the basket can be readily removed for cleaning.



The Elliott Twin Oil Strainer

consists of a performated metal basket mounted in a suitable container, arranged so that the basket can be readily removed for cleaning. The Staples and Pfeiffer so called self-cleaning strainer, which is shown in the illustration, is provided with a by-pass and arranged so that the dirt can be blown out by a steam jet without removing the basket.



Diagrammatic sketch showing the stages through which oil passes between the wells and the refinery, before being delivered to the power house.

In addition to the main strainer on the oil line it is advisable to provide a small fine mesh strainer at each oil burner.

To clean this strainer it is only necessary to turn the handle on top so as to run the oil through the by-pass, place a bucket under the blow-out valve at the bottom and blow steam through by opening the small valve on the side.

In the Elliott Twin strainer, shown above, the body is divided into two compartments, each of which contains a straining basket. By means of a single slide valve at each end, either one of the compartments may be shut off so it can be opened up for cleaning, while the oil is flowing through the other compartment.

RAILROAD ELECTRIFICATION IN SOUTH AMERICA

An electrification is now under way over the line of the Paulista Railway Company between Jundiaby and Campinas, Brazil, a distance of 45 kilometers, or about 28 miles. But since the road is of double track construction the total mileage, including switches and extra track, amounts to 76 miles.

The equipment, which is to be supplied by the International General Electric Company, consists of 12 locomotives, 8 freight and 4 passenger engines, material for the transmission line and sub-station, and a 3000-volt overhead, of the twenty-century type construction.

This project anticipates further extensions amounting to one hundred additional miles of route which may eventually bring the total electrification up to 128 miles, extending between Jundiaby and San Carlos.

The locomotives will be of the geared type, 3000-volt, direct current. The freight locomotives will weigh 100 tons each, all weight on driving axles, and the passenger engine 120 tons, equipped with two axle guiding trucks at each end.

Power for the operation of the lines will be supplied by the San Palo Light and Power Company at 88,000 volts, 60 cycles.

It is expected that the new line will be in operation in July, 1921.

SPARKS—Current Facts, Figures and Fancy

(Do you know how much salt there is in the seas or how many people speak the English language? Do you know what country has the greatest spending power or how long it takes to cut a track rail by electricity? These questions are answered on the following page, along with bits of information concerning the industrial development of China and South America. —The Editor.)

It is calculated that the evaporation of the oceans would leave a layer of salt 235 feet thick.

* * *

From 1892 to 1914 California water-power increased from about 600 to nearly 600,000 horsepower.

* * *

The spending power of the Australian population, according to statistics, is higher than that of any other people of the world.

* * *

It is estimated that over 140,000,000 people now speak the English language, over 51,000,000 the French, 75,000,000 German, 35,000,000 Italian, 42,000,000 Spanish, 13,000,000 Portuguese and 75,000,000 Russian.

* * *

The distance from Liverpool to Hongkong is 9,651 miles, whereas the distance from San Francisco to Manila is 6,221 miles, a differential in favor of San Francisco of 3,431 miles, or equal to about twelve days sailing one way.

* * *

Buying milk by the stick sounds like a gingerbread-house fairy tale, but in some parts of Siberia it is an everyday affair. Owing to the somewhat chilly climate most of the food sold in shops is in a frozen state, milk being sold in long sticks and meat hacked with axes.

* * *

It is predicted that instead of 100,000 persons in the factories of China and 4,000,000 children in schools (the estimates for 1918), the China of a few decades hence will have 40,000,000 factory hands and 80,000,000 school children, figures proportionate to the present statistics of the United States.

* * *

A small electric fountain is the latest in table decorations. A little electric motor is directly connected with a small rotary pump that forces the water from the well up into a ring fitted with some 20 small nozzles. About one quart of water is used, and the overflow leaks back again into the reservoir to be used over again. The height of the water is regulated by a valve on the supply ring in the basin.

* * *

An electrically operated compress, which will compress bulky cotton bales 42½ pounds to a cubic foot, is a modern device employed in Los Angeles. The cotton is brought in loose bales and when the compress has been filled the cotton is pressed together with enormous force. This makes it possible to load 200 bales of cotton into one 50-foot freight car. The system has not yet been applied to the passenger service.

A motor operated saw for cutting track rails wherever electricity is available has recently been placed on the market. The machine is of simple construction, consisting merely of a motor and starting box, a supporting frame, a gear and a connecting rod which operates the saw frame. The maker states that the machine will cut a nine-inch girder rail in from 15 to 18 minutes and it is estimated that one blade will cut from eight to ten rails.

* * *

The light and power, and electric-railway companies in Montevideo, Uruguay, have their own shops and do their own repairing. The present freight situation would make the shipment of dynamos and motors to the United States or to Europe for repair exceedingly expensive. It is suggested that a market may be found here for insulated armature coils among consumers who do their own repairing. Montevideo has alternating current.

* * *

Inasmuch as there is no water-supply system for the city of Asuncion, which has about 80,000 population, or for any of the other cities or towns of the republic of Paraguay, there is a constant demand for a limited supply of hand pumps, windmill pumps, electrical and gas pumps to be used in wells. The total value of all pumps imported into Paraguay in a year averages about $6,000, of which more than half represents imports from the United States.

* * *

Stainless steel is being employed very largely in the manufacture of pump rods, valve spindles, valves, and other parts which are exposed to contact with water, steam, and other corrosives. The scentific-instrument trade is using it for drawing instruments. It is being manufactured into stair rods, saucepans, and pans of varying shapes, fenders for the hearth, and even into pokers and garden implements. Sport is also taking an interest in stainless steel and is promoting a demand for golf-club heads, spurs, and so forth.

* * *

A plant for the production of synthetic ammonia, operated entirely by hydroelectric power, has recently been successfully put under way in Italy. Water is decomposed into oxygen and hydrogen by electrolysis. The hydrogen is stored in tanks and conveyed to a receptacle of the size and appearance of an upright hoisting-engine boiler. In this receptacle is carried out a process of which the details are kept secret and which constitutes the essence of the new method for producing synthetic ammonia, and tremendous pressure is then applied to the resultant gaseous products. Ammonia issues from the factory in portable steel cylinders.

PERSONALS

James H. McGraw, president of the McGraw-Hill Company, is a Pacific Coast visitor. The McGraw-Hill Company, in addition to publishing the Journal of Electricity, is the owner of ten other national engineering magazines, among which are Electrical World and Electrical Merchandising, which together with the Journal of Electricity are known to the trade as the McGraw-Hill Electrical Trio. Mr. McGraw is a forceful factor in the development of the educational idea in technical journalism, and today stands foremost throughout the world as the developer of the highest type of engineering technical magazine activity. One of the most powerful impressions made upon the recent vast audiences of the Foreign Trade convention at San Francisco was the paper of Mr. McGraw's which is entitled "Service of the Business Press to Foreign Trade," excerpts of which appear elsewhere in this issue of the Journal of Electricity. Mr. McGraw is accompanied in his present tour by **D. H. Braymer,** managing editor of Electrical World. They both expect to spend some weeks on the Pacific Coast in looking into the splendid new opportunities for the service of technical journalism in this growing section of our country.

Masakazu Imai, electrical engineer of the South Manchurian Railway Company, was recently in San Francisco.

J. C. Barber, manager of the Citizens Light and Power Company of Ketchikan, Alaska, has been to Seattle on a business trip.

B. Badrian, district manager in California for the Hurley Machine Company, is visiting Los Angeles dealers for the purpose of stimulating Thor sales.

Arthur L. Ives of the New York firm of Ives and Davidson remained in Los Angeles for several weeks following the Pasadena convention to look after local interests.

L. R. Ardouin, secretary of the San Francisco Association of Electrical Contractors and Dealers, has resigned his position with the association to take up the study of law.

George Barker, National Carbon Company of San Francisco, and **V. D. Harrison,** Pacific States Electric Company of Seattle, have just returned from an extended business trip through Alaska.

L. E. Rynearson, sewing machine specialist for the Pacific States Electric Company, has recently returned to Los Angeles after having spent two months working with dealers in the northern part of the state.

M. J. Verdery, Jr., formerly of the Hurley Machine Company, manufacturers of the Thor washing machine, and later manager, electric range department, of the Great Western Power Company, has recently become associated with the securities department of the Anglo-California Trust Company of San Francisco.

W. W. Briggs, formerly of the Westinghouse Electric & Manufacturing Company and of the Great Western Power Company of San Francisco, and now manager of the New York district of the Westinghouse Lamp Company, is spending some time on a visit in San Francisco. On June 9th he gave a most interesting talk before the Downtown Association on his impressions of industry and electrical matters in the West.

W. L. Strandborg, publicity manager of the Portland Railway Light and Power Company, has been nominated by the united Ad clubs of the Pacific Coast for the position of vice-president of the Associated Ad Clubs of the World.

C. E. Magnusson, professor of electrical engineering and acting dean of the College of Engineering at the University of Washington, was elected a vice-president of the American Institute of Electrical Engineers at the annual business meeting held recently.

George Patterson of Stanley and Patterson, New York, and a party of ten are making an extended trip through the West. Their itinerary will include Los Angeles, San Francisco, Seattle and return to the East through Canada.

Charles H. Peirson, advertising agent of the Southern California Edison Company, **Fred B. Lewis,** Los Angeles superintendent of the same company, and **A. W. Childs,** superintendent of sales of the southern company were recent visitors in San Francisco.

Gordon C. Osborne is now assistant chief of the department of electricity of the city of San Francisco, having been appointed to fill the position formerly occupied by Ralph H. Wiley. Mr. Osborne has been connected with the department of electricity for several years.

O. W. Peterson, construction superintendent of the Pacific Gas & Electric Company, has left the employ of the company to take charge of the construction of tunnel number one of the Caribou project of the Great Western Power Company. The contract for the driving of this tunnel has been let to the Shattuck Construction Company of San Francisco.

R. C. Lamphier, general manager of the Sangamo Electric Company of Springfield, Illinois; **R. E. Gorton,** manager of the Packard Lamp Division of the National Lamp Company of Warren, Ohio; **H. E. Sanderson,** Pacific Coast manager of the Bryant Electric Company, and **Frank Burton,** general sales manager of the same company, were recent visitors at Seattle.

Frank Vanderlip, chairman of the American International Corporation and president of the Japan Society of New York, who has headed a group of bankers, manufacturers and business men on a mission to Japan, addressed a recent meeting of the San Francisco Commercial Club and brought out, in a very forceful and helpful manner, how international relations between countries on the Pacific may be better fostered.

Ralph H. Wiley has just succeeded Arthur Kempston as chief of the department of electricity of the city of San Francisco. From 1905 until 1908 Mr. Wiley was in the employ of the Pacific Telephone & Telegraph Company in the installation department and left the employ of that company to become superintendent of an independent telephone company. Since 1912 he has been in the department of electricity of San Francisco, starting in as underground engineer in charge of the installation of the present underground system of the department, which amounts to practically 250,000 feet of cable. Mr. Wiley also drew up the circuits and supervised the installation of the signaling system at the new central fire alarm station, in connection with James M. Barry, who engineered the power equipment when the station was put into service in 1915. In April, 1917, Mr. Wiley was appointed assistant chief of the department and at the same time continued to perform the duties of underground engineer, which position he held until his recent promotion.

Julean Arnold, commercial attache from the United States to the Republic of China, is making an extended visit on the Pacific Coast with headquarters at San Francisco. In former years he has been perhaps our most prominent figure in developing a new idealism in China and presenting the claims of American engineering enterprise in the development of the great republic of the Far East. Mr. Arnold is a graduate of the University of California with the class of 1902, and has been with the consular service practically entirely since his graduation, and has been many years a resident of China. He speaks the Chinese language fluently, and in his work in the Orient is a powerful aid to the development of electrical trade along with our splendid new growth in all lines of commerce.

R. D. Berst, electric distribution department of the Pacific Gas & Electric Company, has left the employ of the company to accept a position with the southern branch of the University of California in Los Angeles.

F. H. Babcock, G. F. Brown and **H. H. Dewey,** from the engineering department of the General Electric Company in Schenectady, were recent visitors in Los Angeles where they have been doing some work in connection with the new Big Creek Plant Number Eight, which is the latest undertaking of the Southern California Edison Company.

Ned Dean, a mechanical engineer in the testing department of the Westinghouse Air Brake Company with headquarters in Pittsburgh, Pa., is a recent San Francisco and Pacific Coast visitor. Mr. Dean is a graduate of the University of California and has been engaged in engineering activities of the Westinghouse Company in the East for some years past.

Sir Vincent Raven, chief mechanical engineer of the British railroad systems, accompanied by his chief designer, H. J. Robson and by M. Lydal, consulting engineer of the London and Northeastern Railroad of England, have recently inspected the Chicago, Milwaukee and St. Paul electrification. The British engineers will return to the east by way of California.

C. L. Edgar has accepted the appointment as chairman of the Executive Committee of the Society for Electrical Development. He announces his intention to call bi-monthly meetings of this committee to give close attention to the important matters coming up for consideration, and secure for the electrical industry the full benefit of the great work the society is carrying on.

C. S. MacCalla, formerly general manager of the Washington Water Power Company, is now manager of the Rochester Works of the General Electric Company at Rochester, New York. Mr. MacCalla's new activities are contributing in an effectual way to the advance of the use of electrical appliances, as his firm is manufacturing fractional horsepower motors, such as are used on washing machines.

Howard Spreckels, who has been connected with the accounting department of the Universal Electric & Gas Company at San Francisco since the cessation of the war, has resigned, and after a short business trip East will return to San Francisco as secretary of the Pit River Power Company and will devote his energy and interest to the development of this property, which will shortly add 50,000 kw. to the capacity of the hydroelectric plants in northern California.

A. M. Bohnert, formerly assistant to E. H. Steele, superintendent of transmission of the Pacific Gas & Electric Company, has joined the force of The Ohio Brass Company at Mansfield, Ohio, as sales engineer. Mr. Bohnert has been with the Pacific Gas & Electric Company for the past eight years, with the exception of two and a half years during the war when he was Captain of Engineers, U. S. Army, acting as Assistant in charge Electrical Mechanical Section, Office Chief Engineer, A. E. F., France.

Howard Elliott and **L. B. Stillwell,** two engineers, have been elected as directors of the Chamber of Commrece, U. S. A. Mr. Elliott is a member of the American Society of Civil Engineers and chairman of the board of the Northern Pacific Railway, New York City. Mr. Stillwell is a past president of the American Institute of Consulting Engineers and of the American Society of Electrical Engineers, a member of the American Society of Civil Engineers and an electrical and consulting engineer, New York City.

Paul McKee, vice-president and general manager of the California-Oregon Power Company, has only recently been elected to this new position due to the financial reorganization of the company. Mr. McKee is one of the young men of the industry and many constructive things are looked forward to as a result of his able efforts in behalf of the industry. The company, under its reorganization plan, is wiping out any question of improper financing and under the new basis only actual physical assets will be represented.

E. M. Herr of Pittsburgh, president of the Westinghouse Electric & Manufacturing Company, and **L. A. Osborne** of New York, president of the Westinghouse Electric International Company, were recently decorated by the Emperor of Japan with the Order of the Rising Sun. These American manufacturers have been several months in Japan studying Oriental conditions. The Order of the Rising Sun is the highest honor the Emperor can bestow. Mr. Herr received the third class and Mr. Osborne the fourth, the higher classes being awarded only to Japanese national heroes.

John B. Fisken, consulting engineer for the Washington Water Power Company and president of the Northwest Electric Light and Power Association, was a recent San Francisco visitor. Mr. Fisken has now returned to his headquarters at Spokane, Washington, after a delightful attendance at the recent N. E. L. A. Convention at Pasadena, California. Much interest is now being centered in the West on the forthcoming convention of the Northwest Association which is to meet in Spokane during the middle of September of this year, and in which Mr. Fisken's well known executive ability is expected to play a most helpful part.

E. W. Garcia, on the left, and **J. J. Laingor,** on the right, lighting engineers with the General Electric Company, San Francisco, have been unusually successful in introducing the electrical idea into the public school through the school entertainment. The story of the entertainment given recently at the Francis E. Willard School in Berkeley, which appears in this issue of the Journal of Electricity, is an example of the type of work they are doing to show the public what satisfactory effects may be obtained through the correct application of electrical illumination.

Meeting Notices for Electrical Men

(The program of the Pacific Coast Convention of the A. I. E. E., which will be held July 21-24, and the plans which have been made for the annual meeting of the California Association of Electrical Contractors and Dealers, to be held June 24-26, are given in the following pages. A. I. E. E. and A. S. M. E. activities in San Francisco and in the Northwest also appear along with announcements concerning Illuminating Engineers and San Francisco Commonwealth Club activities.—The Editor.)

San Francisco Electrical Development League

There was a large attendance at the May twenty-fourth meeting of the San Francisco Electrical Development League to hear the message of W. L. Goodwin and Harry Kirkland. Previous to the regular talks Chairman E. O. Shreve called upon Lee H. Newbert, newly elected president of the Pacific Coast Section N. E. L. A., to congratulate him, and asked for a few remarks regarding the success of the convention at Pasadena. A. C. McMicken, sales manager of the Portland Railway Light and Power Company announced that the Pacific Coast Convention of the A. I. E. E. was to be held in Portland from July twenty-first to twenty-fourth inclusive and asked for a large representation from California.

Samuel H. Taylor, Electric Railway and Manufacturers Supply Company, who was chairman of the day, announced Harry Kirkland of the General Electric Company by stating that the day would tell the League how a California-made product was being spread through the East. Harry Kirkland spoke on "Fellowship" and said that at the two wonderful conventions held at Pasadena the electrical men of the East had a chance to see in action the ideas that Bill Goodwin had been trying to spread throughout the East, and that the California spirit had been proven to the Easterners, who would go home convinced that the cooperative plan could be worked out successfully.

"Bill" Goodwin was given a royal welcome when he arose to speak, and though the demonstration rather disconcerted him at first, he soon found himself and started telling the various branches of the industry in no uncertain terms just what was the matter with them. He began by telling of his work in the East, and said that California had been held up as an example to the East and that while some of the things he told the East had been discounted for that reason, the men who attended the convention would return convinced and his message would be accepted. In pointing out the problems that confront the industry Mr. Goodwin said that these problems were being solved faster in the West than anywhere else, but that they were still big problems out here and the first and most important of them to be solved was the question of acquiring finances for the development of our hydroelectric resources. Speaking of the responsibility of the press he said: "The Journal of Electricity is the mouthpiece of the Pacific Coast where the cooperative plan has been successfully worked out, and the Journal has grasped the idea of this cooperative plan and has done a lot to help it along. Therefore see to it that this journal is planted in of your Eastern offices to get this message across east of the Rockies. There is the real human spirit in the Journal of Electricity, which is the difference between the publications of the East and the West."

He summarized the problems of the industry under four heads: the need for funds, the necessity for right thinking in the industry, the electrification of railroads, and the development of the electrical retail merchant.

Mr. Samuel Adams Chase of the Westinghouse Electric & Manufacturing Company was scheduled as one of the speakers, but was unable to attend the meeting on account of illness. The Development League through the chairman of the day sent a message of regret to Mr. Chase and best wishes for a speedy recovery.

BUILDERS OF THE WEST — LXXIX

BENJAMIN HOLT

The tank proved to be not only the sensation of the war, but an effective weapon in meeting the issues of combat, and to the West must go the credit for this triumph of modern warfare. To Benjamin Holt, inventive genius of the West, whose faith in the "caterpillar" has proven so steadfast since the earliest experiments with his invention, this issue of the Journal of Electricity is affectionately dedicated; not so much, however, for his contribution to the sinews of war as for the revolutionary methods that his genius has brought forth in the application of the tractor upon the farm, enabling the West to pass to vast new planes of accomplishment in agricultural development.

San Francisco Section, A. S. M. E.

The meeting of the San Francisco Section, American Society of Mechanical Engineers, held at the Engineers' Club on May twenty-seventh was addressed by Mr. F. A. Foster, instructor in mechanical engineering at the college in Peking.

The talk was illustrated by a series of lantern slides showing the methods used in China by the various trades, including carpenters and metal workers, and in the various textile and flour mills. Mr. Foster has just returned from China after being in that country for over ten years, and is thoroughly conversant with conditions there.

Spokane Section, A. I. E. E.

The annual dinner of the Spokane Section of the American Institute of Electrical Engineers was held at the Davenport Hotel in Spokane on the evening of May twenty-first. Following the dinner the annual election of officers was held, the rest of the evening being given over to a paper by Charles A. Lund, distribution engineer of Tacoma, who spoke on "Public Utility Valuation."

Illuminating Engineers Organize in San Francisco

The earnest interest in better lighting standards of the twenty-five members of the Illuminating Engineers Society residing in the bay district was shown when nearly twenty of them gathered in San Francisco for the first time on May 29 in honor of the visit of S. E. Doane, president of the society, and to take the necessary steps to form a San Francisco branch.

Since 1915 the Coast representative of the society, Romaine Myers, has been instrumental in achieving the following accomplishments: California Industrial Lighting Laws, which have been considered the standard for other states;

automobile headlighting laws; the preparation of several school lighting exhibits, and plans for permanent industrial lighting demonstrations in San Francisco and Los Angeles.

In addressing the meeting Mr. Doane, who is chief engineer of the National Lamp Works of the General Electric Company, stated that one of the fundamental problems confronting the illuminating engineers was to educate the public in the nomenclature of the art. While the engineers themselves have a clear conception of these they seem to lack a way of expressing them to the non-technical consumers.

He pointed out the possibility of confusion arising through the fact of so much attention being given to industrial lighting demonstrations throughout the country, unless equal stress is laid on the subject of home and shop lighting. The home is as much of an industrial establishment as is the factory, and exhibits of proper home lighting should be installed simultaneously with the others.

Mr. Doane outlined the activities which are now being followed by the society. These are generally for the wider distribution of the highly specialized knowledge at the command of the society. Among these are the following:

1. Education committee: (a) College education, (b) Grade school education, (c) Correspondence schools. 2. Reciprocal relations committee, which is attempting to have illumination committees as part of the activities of each of the other national societies. 3. Compilation of symposiums on various subjects from the publications of the Society. 4. Decentralization of the Society for the further benefit of the membership at large.

A committee consisting of L. E. Voyer, chairman, J. A. Vandegrift, H. H. Millar, Miles Steele and Romaine Myers, was chosen to draw up the necessary by-laws and petition to the Society Council requesting that a charter be granted the San Francisco branch.

British Columbia Contractor-Dealers' Convention

British Columbia electrical contractors and dealers, central stations, manufacturers and jobbers held an enthusiastic convention at Vancouver, B. C., on May 31 and June 1 at which cooperation, advertising and optimism were the leading features discussed. "Bill" Goodwin was the central figure among the visitors. He was accompanied by Harry Kirkland, general manager of the American Conduit Company, O. H. Caldwell, editor of Electrical Merchandising, and M. K. Pike, general sales manager of the Northern Electric Company of Montreal. The chairman was E. Brettell, president of the Vancouver Electrical Contractors and Dealers' Association.

The convention was opened by an address by Mayor R. H. Gale. He was followed by O. H. Caldwell. Mr. Caldwell urged the electrical industry to advertise its wares. One of the suggestions he made was for the standardization of electrical instruments, such as plugs. He said an investigation had shown there were 37 different kinds on the market and that the kind with two parallel blades was the best.

W. L. Goodwin in a few preliminary remarks pointed out the necessity for cooperation, the lack of which had lost business to hardware stores and department stores. He criticized the local association for adopting the motto of "Reliable repair service," saying that electrical apparatus should not need repairing.

"Electrical appliance stores," he said, "must become more attractive to the public in order to secure the business which is rightfully theirs."

The afternoon session on the first day was taken up by an address by Harry Kirkland, substituting for Sam Chase, and by a discussion on the "Problem of the Electrical Contractor" by Mr. Goodwin. Mr. Goodwin urged the abandonment of shady practices and the competitive system of bidding. He told of one local contract which was obtained on a price of about $190 while the extras came to about $2,000. He said:

"The electrical contractor who makes his business pay on the bidding basis has been the man in the major number of instances who has been successful through selfish, deceptive practices in eliminating from nearly every set of specifications about one-half of those things which would justly make the installation of added electrical appliances in the ordinary house impossible, for the reason that just 5 per cent of the houses on the entire western continent are, through his collective manipulations, rendered unfit by reason of poor quality wiring and installation, to receive much needed addition in the way of modern electricaal appliances.

"By its very nature, the business of contracting is one that permits of sharp practices. Electrical contracting is not and never was a strictly legitimate business. Real specifications, prepared in an intelligent way, would prevent the contractor tearing down, pulling out or eliminating the majority of items. He is constantly taking off his bill of materials, substituting the proverbial 'something just as good," with whatever will cut into the cost price of the real thing. He is quite unwilling to work on a time and material basis—the only way in which the consumer gets his money's worth—for then he gets exactly what he pays for."

Mr. Goodwin went into details of merchandising and advertising at the evening banquet, using his well-known charts. Other speakers were O. H. Caldwell, W. W. Fraser, Karry Kirkland, Harry Pim, local manager of the Canadian General Electric Company, and E. Brettell, chairman.

The banquet was enlivened by the Northern Electric troupe of minstrels, led by W. C. Mainwaring, sales manager of that company.

Following a further discussion of the contracting problem by Mr. Goodwin on the second day of the convention, addresses were made by E. E. Walker, sales manager of the B. C. Electric Railway Company, and James Lightbody, publicity manager of the same company.

Mr. Walker said that his company sold about $130,000 worth of electrical merchandise in a year but saw no reason why the sales of the combined electrical trade in Vancouver should not be $500,000 a year.

The subject of Mr. Lightbody's talk was "Cooperative Merchandising" on the plan carried out in California. He urged that every element in the electrical industry should combine to put over the electrical idea, so that electrical appliances should be as common in homes as gramophones.

"Electrical merchandising is what you make it," he said. "The business is not ready made. You must reach out and grasp it. If you advertise individually, your advertisement will be lost. If you combine on a cooperative page, you will increase the pulling power of your advertisements."

Mr. Goodwin expounded further upon the California Cooperative Campaign and advocated the formation of a similar body in Vancouver with such help in the composition of advertising and organization of sales campaigns as could be obtained in voluntary bodies.

The luncheon on the second day was a joint session with the Rotary Club of Vancouver, which was addressed by Mr. Goodwin. He emphasized the necessity of electrical development if the community was to progress. He further urged a square deal not only to central stations but also to street railways and telephone companies, as the ability to obtain capital for electrical development was linked up with public opinion as regards every other branch of the electrical industry.

The delegates then embarked on the "Britannia" which was chartered by the British Columbia Railway Company and enjoyed a trip to Indian river, past the power plants of the British Columbia Electric Company. The guests sat down to refreshments in the Wigwam Inn before returning to the city.

In the evening of the same day, the delegates joined in a banquet and cabaret held under the auspices of the Vancouver Electric Club.

The committee in charge of the convention was composed of—

E. Brettell, Electric Supply Company, Vancouver.
J. F. Little, manager, Northern Electric Company, Vancouver.
S. E. Jarvis, Jarvis Electric Company.
R. G. Hargreaves, secretary, Vancouver Electrical Contractors and Dealers' Association.
W. W. Fraser, Electrical Contractor.
E. E. Walker, sales engineer, B. C. Electric Railway Company.

One of the magnificent views to be seen from the Columbia River highway a short distance from Portland, Oregon, where the Pacific Coast Convention of the A. I. E. E. is to be held.

PACIFIC COAST CONVENTION, A. I. E. E.

The Pacific Coast Convention of the American Institute of Electrical Engineers which is to meet in Portland, Oregon, from July 21st to July 24th, has laid out an excellent program of technical papers and has provided for the entertainment of the delegates and visiting ladies.

On Wednesday, July 21st, there will be three papers presented on suspension insulators: "The Design and Application of Suspension Insulators," by W. D. A. Peaslee, electrical engineer of the Jeffery-Dewitt Insulator Company; "Unit Voltage Duties in Long Suspension Insulator Strings," by Harris J. Ryan and Henry H. Henline of Stanford University; and "Electrical Characteristics of the Suspension Insulator at the Higher Voltages," by F. W. Peek, consulting engineer, General Electric Company, Pittsfield, Mass. Discussion of the three papers on suspension insulators will be combined. During the evening the delegates will be taken on an automobile tour over the scenic highways and boulevards of the city.

The following papers will be presented on Thursday: "Railway Electrification," by Renier Beeuwkes, electrical engineer, Chicago, Milwaukee and St. Paul Railroad; "Bridge Methods for Alternating Current Measurements," by D. I. Cone, Pacific Telephone & Telegraph Company; and "Sawmill Refuse, Fuel Oil and Pulverized Coal," by Darrah Corbet, Chas. C. Moore and Company, Engineers.

The morning session on Friday, July 23, will be taken up with the reading of two papers, one on the "Power Factor Correction on Distribution Systems," by D. M. Jones, General Electric Company, Schenectady, N. Y., and the other, "Use of Special Steels in Pressed Steel Transmission Line Fittings," by L. R. O'Neill, chief engineer of the Maryland Pressed Steel Company. The afternoon will be given over to golf, a tournament being held for the John B. Fisken Cup. For those who do not golf a trip has been planned along the scenic Columbia River Highway, dinner being served at the Crown Point Chalet.

These falls near Portland, Oregon, are an example of the many beautiful points which A. I. E. E. convention delegates will be interested in visiting.

Tours of inspection to the steam and hydroelectric plants of the Portland Railway Light and Power Company and the Northwestern Electric Company have been planned for Saturday morning, and to other points of interest in and around Portland.

Section officers and chairmen of the convention committees are as follows:

Acting chairman—E. F. Whitney, General Electric Company, Portland.
Secretary—W. C. Heston, Portland Ry. Light & Power Co.
General Convention Committee—R. M. Boykin, North Coast Power Co.
Arrangements Committee—J. E. Yates, Pac. Power & Light Co., Portland.
Entertainment—R. F. Monges, General Electric Company, Portland.
Program—O. B. Coldwell, Portland Ry. Light & Power Co.

Oregon City Falls of Oregon City, Oregon, which is one of the many beautiful falls of the Pacific Northwest.

COMING CONVENTIONS

American Institute of Electrical Engineers—
Portland, Oregon. —July 21-24

American Society of Civil Engineers—
Portland, Oregon. —August 10, 11

Northwest Electric Light and Power Association—
Spokane, Washington. —September 15-18

Annual Meeting of Contractor-Dealers

Extensive plans are being made to insure the success of the annual meeting of the California State Association of Electrical Contractors and Dealers which is to be held at San Jose from June 24th to 26th, at the Hotel Vendome. The executive committee meeting will be held Thursday night, June 24th, and Friday will be given over to the business meetings. The main business on Saturday morning will be the election of officers of the state association for the coming year.

Cup presented by E. J. Crilley to be awarded at the June golf tournament.

The entertainment committee has provided for card parties and swimming contests for the ladies, with suitable prizes.

Sunday afternoon there will be a golf tournament for a cup that has been presented by E. J. Crilley of the Habirshaw Wire Company, and Saturday night there will be a dinner dance in honor of the newly elected officers. Hotel reservations must be made through the office of the state secretary.

The following committees have been appointed to handle the meeting:

Committee on Arrangements:
E. E. Brown, Brown-Langlais, San Francisco.
T. J. Bennett, Rex Electric Company, San Francisco.
Charles Fazer, Fazer Bros., San Jose.
B. F. Fanning, Crow-Fanning Co., Los Angeles.
H. W. Kimball, Kimball Electric Company, Oakland.
M. L. Scobey, Home Electrical, San Francisco.

Ladies' Entertainment Committee:
A. E. Rowe, chairman, Garnett Young Company, San Francisco.

Nominating Committee:
G. E. Arbogast, F. E. Newbery Company, Los Angeles.
H. L. Miller, H. L. Miller Company, Pasadena.
H. H. Courtright, Valley Electric Supply Company, Fresno.
W. H. Gribble, Western Gas and Electric Appliance Co., Chico.
C. B. Kenny, NePage-McKenny Company, San Francisco.

Fishermen and Near Fishermen at the Recent Convention of Electrical Supply Jobbers, Del Monte, California

Note the honest open countenances of the fishermen and the guilty look on the faces of the "fakirs." Take, for instance, Number 3 from the left in the first view, which shows J. J. Keith of the Altorfer Brothers Company, with its serious mien as compared with the smiling, open countenance of J. O. Wetherbie of the General Electric Company, appearing on the extreme right in the second view. Anyhow, there is just a little fish shown in the picture even though they didn't catch it themselves.

Commonwealth Club to Hold Water Resources Meeting

At the June 17th meeting of the Commonwealth Club of San Francisco the question of the development of water resources will be discussed by eminent authorities on each particular branch of the subject. There will be five papers presented, all of which will deal with the necessity for a comprehensive plan for the early development of the water resources of California which is a most important factor in assuring the future prosperity of the state. The first paper will be presented by John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, and R. H. Ballard, vice-president and general manager of the Southern California Edison Company, and will show what the development of water power in the past has meant to the state. It will also include a statement of the present annual demand for power, the estimated cost to meet this demand in the future and a description of the projects now in process of construction.

Frank Adams, irrigation manager of the local office of the U. S. Department of Agriculture, will give a paper on what the use of California's water supply for artificial irrigation means to the state. H. G. Butler, power administrator of the California Railroad Commission, will tell of the undeveloped water resources of California. C. H. Lee, chairman of the California Water Commission, will show the present great activity in the use of water as shown by the applications made to the California Water Commission. The last paper will be on the obligation of the public to supply funds for the development of these natural resources fast enough to keep pace with the growth of the state, and will be read by Paul Sinsheimer, vice-president of the Union Trust Company of San Francisco.

Electrical Subjects at Los Angeles Ad Club

Col. Chas. W. Decker, well known in electrical circles, presided at the Los Angeles Ad Club luncheon on May 25th. Two of his speakers talked on electrical subjects, Mr. P. L. Thompson, advertising manager of the Western Electric Company talking of our Cooperative Campaign and Mr. Montaville Flowers presenting a powerful appeal for civic independence in which was included a forceful denunciation of municipal ownership.

Fishermen

1. A. E. Legge, Public Service Company, Chicago. 2. R. P. Tillotson, Appleton Electric Company, Chicago. 3. J. J. Keith, Advertising Manager, Altorfer Bros. Co., Peoria, Ill. 4. R. E. Gorton, Packard Lamp Company, Warren, Ohio. 5. C. A. Harding, Commonwealth Edison Company, Chicago. 6. W. F. Bissell, The F. Bissell Co., Toledo, Ohio. 7. L. W. Kittman, Electric Supply Jobbers Association, Chicago.

Near-Fishermen

1. R. P. Oblinger, Ind. Electric Supply Co., Indianapolis, Ind. 2. Jas. Clark, Jr., J. Clark Jr. Elec. Co., Louisville, Ky. 3. H. E. Rasmussen, Ind. Electric Supply Co., Indianapolis, Ind. 4. C. J. Litscher, C. J. Litscher Electric Co., Grand Rapids, Mich. 5. B. B. Downs, St. Paul Electric Co., St. Paul, Minn. 6. J. O. Weatherbie, General Electric Company, Schenectady, N. Y.

HAPPENINGS IN THE INDUSTRY

POWER RATES IN JAPAN

The cheapness of electric power in Japan, which has been one of the factors in its rapid industrial development, is shown by the fact that even after a recent raise in rates by the Nagoya Electric Light Company, which supplies the larger industrial companies of Nagoya with electric current, the prices will range from only 0.8 cent to 1.3 cents per kilowatt-hour. This raise is supposed to operate for a period of two years and supersedes the former rates, ranging from 0.5 cent to 1 cent per kilowatt-hour. The increase of even such low rates met with strong opposition from the companies using the current, but it is believed that the raise will be sustained on account of the shortage of power, not only in Nagoya but throughout the country.

SKAGIT RIVER PROJECT AUTHORIZED

Authority has been granted to the city of Seattle by the United States Department of Agriculture to proceed with the Skagit River Development. In the authorization of the project the city is given a perpetual right to the waters of the Skagit River as a source of light and power for the city, with the stipulation that the city would start work on the project before December 2, 1920, and that the work would be completed before December 22, 1922. The government in turn agreed that the permit would be enjoyed by the city without charge to the extent that the power to be generated by the plant be "sold to the public without profit or used by the permittee for municipal purposes."

The Gorge Creek project which is specifically authorized in the permit when completed will consist of a masonry dam across the Skagit River, a tunnel to conduct the water through the mountain to the power plant two miles away and a power house with a capacity of 50,000 horsepower. Preliminary work on the project, which has already been started, will necessitate the construction of a railroad twenty-six miles in length and the installation of a 3,000 hp. unit to furnish power for the construction work.

The first of the bonds for this project have been put on sale by the city comptroller. These are a part of the $5,500,000 issue authorized by the recent election and are in the denominations of $100, $500 and $1,000 at par value. They pay six per cent and it is hoped that a large number of the citizens of Seattle will purchase them and so become interested financially in the city's utilities.

APPLICATION TO PURCHASE COMPANY

The Yuma Light, Gas and Water Company wants to buy the electric and water plant owned by the Winterhaven Improvement Company and giving service to the residents of Winterhaven, Imperial county. The Winterhaven company wants to make the deal and both companies have joined in an application to the Railroad Commission asking for an order approving the transaction. The Winterhaven company says that it is unable to give proper service on account of the small number of consumers. The Yuma company serves the town of Yuma and also the territory on the California side of the Colorado river near Yuma, including the U. S. Indian school.

BUSINESS MEN TO ASSIST POWER COMPANY

A group of business men of Baker and Union counties, Oregon, are promoting a scheme to erect a power plant that will cost $200,000. The plant will be leased to the Eastern Oregon Light and Power Company which will stand half of the construction cost of the new plant.

BRITISH COLUMBIA COMMISSION DISSOLVED

The repeal of the Public Utilities Act of British Columbia, by the legislative assembly of the province, has brought out serious charges against the provincial government by the former commissioner, Major J. L. Retallack. The major has made the charge that the principal reason for the dissolution of the commission was to get rid of him as he was not sufficiently plastic in the hands of the politicians. Quoting from the act passed at the recent session of the legislature, Major Retallack emphatically asserted that instead of repealing, the act had merely suspended the act under which he was appointed, and that under the repeal act the executive could, from time to time, appoint a new commissioner to deal with any of the matters handled by himself as public utility commissioner, including the six-cent fare inquiry, if jurisdiction over the British Columbia Electric Railway system is restored. The reasons given by the legislature for the repeal of the public utility act were that the Dominion Public Utility Commission had taken jurisdiction over the public utilities in the province and that the continuation of the provincial public utilities commission at an expense for the coming year of $25,000 was not justified.

ATTACHMENT PLUG DECISION

In the suit of Harvey Hubbell, Inc., against the Bryant Electric Company for infringement of the Hubbell patents for attachment plugs, the Circuit Court of Appeals for the Second Circuit has handed down an opinion in favor of the Bryant Electric Company, holding that the Bryant Spartan line of plugs and receptacles do not infringe the Hubbell patents. The Appellate Court orders the bill of complaint to be dismissed with costs of both courts to be paid by the plaintiff.

This means that the Bryant Electric Company can continue to make the various parallel and tandem slot receptacles of the Spartan Interchangeable line as they have always made, and that such devices have not infringed, and do not infringe Hubbell patents.

In a further decision rendered at the same time in the matter of the Burton patent which covered the combination of parallel and tandem slots in one device, the court held said patent invalid—but this does not affect in any way the continued manufacture and sale of Spartan devices.

EDISON GIRLS HAVE JINKS

Determined not to be outdone by the entertainments given by the men from time to time, the girls of the Southern California Edison Company, two hundred in number, gave a high jinks on the evening of May fifth in the assembly room in the Edison Building, Los Angeles. In addition to the customary features of vocal and instrumental music there were some distinct novelties presented for the diversion of the young ladies. One of these unique features was a jazz orchestra composed of fake instruments which looked real enough but sounded like singing through a comb. The party closed with the service of refreshments.

Girls of the Southern California Edison Company

Engineering Committee Report, Pacific Coast Section, N.E.L.A.

(The activity of technical organizations in carrying on research work is of inestimable benefit to the electrical industry, and nowhere is this better evidenced than in the committee work of the National Electric Light Association. Following is the report of the Engineering Committee, Pacific Coast Section N. E. L. A., showing work accomplished during the past year. —The Editor.)

The engineering committee of the Pacific Coast Section of the N. E. L. A. for the year 1919-1920 was as follows:

P. M. Downing, chairman, Pacific Gas & Electric Company; H. A. Barre, Southern California Edison Company; G. E. Armstrong, Southern California Edison Company, now associate editor, Journal of Electricity; J. P. Jollyman, Pacific Gas & Electric Company; S. J. Lisberger, Pacific Gas & Electric Company; J. A. Koontz, Great Western Power Co.; E. A. Quinn, San Joaquin Light & Power Corp.; J. E. Woodbridge, Sierra & San Francisco Power Co.; W. M. Shepard, California-Oregon Power Co.; C. O. Poole, Southern Sierras Power Co.; E. R. Northmore, Los Angeles Gas & Electric Co.; L. M. Klauber, San Diego Cons. Gas & Electric Co.; R. L. Eltringham, State Industrial Accident Commission; John Hood, General Electric Company; W. P. L'Hommedieu, Westinghouse Electric & Manufacturing Company; R. S. Masson, Consulting Engineer; P. M. Wentworth, Reno Traction Water & Power Co.

It has been the endeavor of this committee during the past year to keep in touch with the technical or engineering problems that have come up and which seem to be of importance to industry generally. The work has been carried on through sub-committees appointed with due regard to the qualifications of those selected to represent the Section on the particular matters involved. Some of the work handled by the committee during the year is as follows:

(1) The sub-committee consisting of S. J. Lisberger, chairman, R. Cunningham, L. M. Klauber, H. A. Barre and J. E. Woodbridge, appointed in 1917 to represent the section at the conference called for the purpose of drafting new line construction code of rules to be submitted to the Railroad Commission for use as the basis of an order to supersede its General Order No. 26, has been continued during the year. This sub-committee has had a number of meetings with representatives of the Railroad Commission, the State Industrial Accident Commission, the Insurance Underwriters, various municipalities, labor organizations and others interested in the subject. The result has been a formulation of a tentative code that has been submitted to the Railroad Commission for its consideration. Although not as voluminous as the code prepared by the Bureau of Standards, nevertheless it is felt that in its present form it covers the subject fully, and provides a construction ample to meet every condition found in this state, without imposing restrictive conditions, the cost of which would be very materially in excess of present day costs and make the extension of lines into new and sparsely settled territory almost prohibitive.

The first informal conference to consider this code was held in the office of the Railroad Commission on April 20, 1920.

(2) On October 6, 1919, the Bureau of Standards at Washington called another general meeting of the various wire using utilities and others interested in the safety code being prepared by that body for a further discussion and possible revision of same. The meeting was held in Philadelphia on October 28, 1919. The Pacific Coast Section was invited to have representatives in attendance at the meeting and Messrs. H. A. Barre of the Southern California Edison Company and S. J. Lisberger of the Pacific Gas & Electric Company were appointed to represent the Section. The conference was in session several days without reaching an agreement. Reports indicated a considerable difference of opinion among the various interests represented as to the necessity or propriety of attempting to formulate into a single code, specifications that would be universally applicable to all of the climatic and other conditions obtaining throughout the United States.

(3) The work of the committee representing the Pacific Coast Section at the conferences called by the State Industrial Accident Commission to consider the revision of the Utilization Code, is nearing completion. The various central station companies in both the north and south are ably represented at these conferences, but before the code is issued as a final order, the Commission expects to submit it in tentative form to the various interests concerned and will hold a formal hearing to receive comment and criticism.

(4) By far the most important work done by the engineering committee during the year has been the continuation of the study of line insulators and line insulation under the direction of Prof. Harris J. Ryan of Stanford University. J. A. Koontz, H. A. Barre, J. P. Jollyman and J. E. Woodbridge have given this work their careful and earnest attention, the results of which are outlined in a report presented by the Overhead Committee of the National Association. In this connection, it is fitting that proper credit be given to Prof. Ryan and the University authorities for the interest they have taken in this work. The electrical industry is indeed fortunate in having a man as eminently qualified as Prof. Ryan to handle this very important and difficult problem from a purely scientific standpoint. A great deal of interest is being displayed in the progress of this work, not only by the operating companies but also by the insulator manufacturers, and it is to be hoped that out of the investigation that is being so ably carried on by Prof. Ryan, there will come a solution of the problem of line insulation that will permit the use of voltages not possible with present line equipment.

(5) J. E. Woodbridge represented the Pacific Coast Section at the meeting of the Inductive Interference Committee of the National Association held in Denver on December 1, 2 and 3, and L. M. Klauber represented the Section at the meeting of the overhead systems committee held at the same time and place.

(6) At a meeting of the Prime Movers Committee held in Pittsburgh January 12, J. A. Koontz represented the Pacific Coast Section. S. J. Lisberger represented the section at a meeting of the Apparatus Committee held in Louisville, Ky., on January 15, 16 and 17.

Inasmuch as full reports of the activities of these various national committees was made at the meeting of the National Association, no attempt will be made at this time to outline the scope of the work covered or the results obtained.

TRADE NOTES

Western Agency —

The Montelius Price Company of Seattle have recently taken over the agency of the Roller-Smith Company for the Pacific Northwest and will handle their line of electrical instruments, meters and circuit breakers in the states of Washington, Idaho and part of the state of Oregon.

New Quarters —

The Chicago Fuse Manufacturing Company have recently moved into new quarters in Chicago, taking over a modern two-story building with a floor space of 125,000 square feet. This is said to be the largest factory in this country engaged in the manufacture of fuses and switch boxes.

Lighting Fixture Agent —

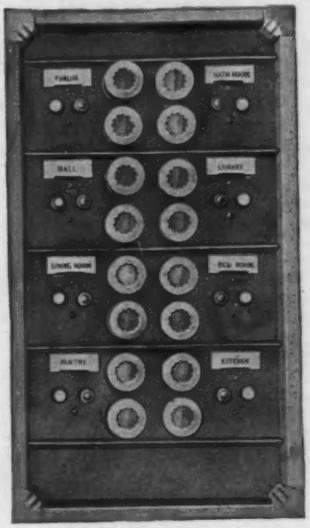
A. M. Lloyd has recently become Pacific Coast agent for Miller and Company, manufacturers of lighting fixtures, with Western sales office in San Francisco.

LATEST IN EVERYTHING ELECTRICAL

(The safety fuse panel which is described on this page is especially convenient where panels without switches are desired. The indicator cord hook which is also described and illustrated enables the engineer to connect the indicator cord with the cross-head of a high speed engine as easily and quickly as with a low-speed engine.—The Editor.)

A NEW SAFETY FUSE PANEL

For apartment or residential use, where distributing panels without switches are desired, the Westinghouse Electric & Manufacturing Company has developed a new type, known as the type "F" safety fuse panel.



The new type "F" safety fuse panel

The plug fuse holders of this panel are mounted on a slate base and a moulded micarta cover is provided through which the fuse holders alone project, all other parts being completely covered. When the fuses are in place, therefore, everything accessible is dead so that accidental contact with live parts is impossible. By removing this cover, however, all terminals are exposed so that the installation of the panel and repairs of any kind are very simple matters.

Another feature of this panel is that it is the narrowest panel of its type on the market. It is made for two and three wire mains of from 30 to 200 amperes in capacity, 125 volts. The number of circuits range from four to thirty-two. Main fuses or a safety-type main switch can be added if desired.

A HANDY INDICATOR CORD HOOK

A very simple and ingenious indicator cord hook has been developed and patented by the Trill Indicator Company, Corry, Pa., which enables the engineer to as easily and quickly connect the indicator cord with the cross-head of a high speed engine as with a low-speed engine.

Experienced engineers appreciate the difficulties and dangers involved in connecting the ordinary indicator cord to the standard on a cross-head. This is especially true in cramped places and on high speed engines. Not only does the engineer risk his life, but there is danger that the indicator may be wrecked.

Numerous devices have already been designed for safely accomplishing this feat, but these devices, although more or less successful, have proved cumbersome and expensive.

The accompanying illustrations clearly show how the patented Trill Cord Hook is attached while the engine is running. The loop of the hook is held between the thumb and the finger in such a position as to allow the pin on the standard to strike the straight part of the hook when the standard is within about one inch of the end of its travel. The hook swings about the thumb and finger as a pivot as illustrated in Fig. 1, which action shoves the hook downward. At that instant the piston has reached the end of its stroke. On the return stroke, the pin on the standard engages the hook as illustrated in Fig. 2, and the attachment is complete. The operation is very simple, and there is absolutely no danger involved.

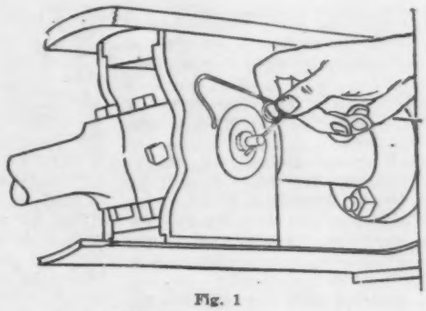


Fig. 1

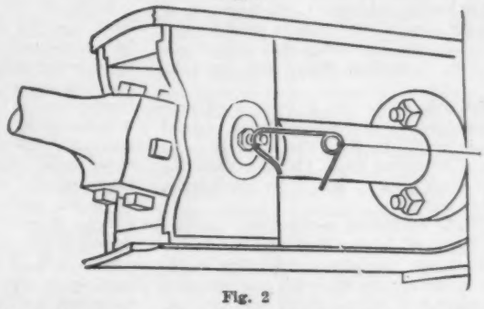


Fig. 2

Illustrations showing how the patent Trill Cord Hook can be attached while the engine is running. In Figure 1 the method of making the connection is shown while Figure 2 shows the completed attachment.

Book and Bulletins

Bulletin on Rubber Insulated Wire

The Standard Underground Cable Company, with general offices in Pittsburg and western offices in Oakland, have issued two interesting publications in the interest of that Wire." This gives a complete list of the various types of rubber insulated wire manufactured as well as several illustrations and view of some of the larger buildings in whose construction Standard Rubber Insulated Wire has been used.

Bulletin on Boiler Insulation

The Celite Products Company of 11 Broadway, New York, is issuing an interesting bulletin known as B-6a describing the insulation construction of different types of boilers. The bulletin is illustrated with diagrams and views of various installations. Copies will be sent on request to all persons interested.

Chamber of Commerce Publications

The San Francisco Chamber of Commerce last month issued three interesting publications in the interest of that city's welfare. In one of these, called "Industrial San Francisco," a two-page spread is devoted to showing the sources of electric power which operates San Francisco's industries. A large relief map shows the numerous transmission lines that carry 350,000 hydroelectric horsepower from stations in the Sierra Nevada mountains to factories on San Francisco Bay.

NEW ELECTRICAL DEVELOPMENT

(Plans for the installation of municipal light and power plants, news of the traction controversy in Seattle and a report of water power development in Alaska appear among items from the Northwest. Reports from the Pacific Central district include news that the Lake Spaulding reservoir in the high Sierras is rapidly filling with water and that application has been made for right to purchase extensive rights on the Fall River; while items concerning the organization of an electric power district and the construction of transmission lines and power houses appear among Southwest and Intermountain reports.—The Editor.)

THE PACIFIC NORTHWEST

MALIN, ORE.—The matter of installing a municipal light and power plant is being considered.

GRANDVIEW, WASH.—The Pacific Power & Light Company proposes to construct a substation at this place.

SEATTLE, WASH.—A contract for ten air compressors hase been awarded by the city to the General Electric Company at $3,390.

EVERETT, WASH.—This place has probably defeated the proposition of issuing bonds to the amount of $2,000,000 for the establishment of a municipal power plant.

JUNEAU, ALASKA.—The Alaskan Endicott Mining & Milling Company, C. W. Mason, president, has a crew of men ready to develop water power to operate a sawmill before installing a stamp mill at William Henry Bay on Lynn Canal.

ROSEBURG, ORE.—The $500,000 bond issue for a municipal light and power plant carried by a vote of 974 to 246. The plant is to be located at Whistlers Bend, 12 miles from the city. A bond issue of $7,500 for an aviation camp also carried.

SEATTLE, WASH.—A contract was awarded by the Board of Public Works to the Pacific Lamp & Supply Company, Prefontaine Building, for furnishing the city with approximately 400,000 lamps with 37 and 27 per cent discount on the basis of $100,000 net purchase.

NEWPORT, WASH.—Calispell Light & Power Company, owning a power line from Dalkena to Cusick, has applied to State Hydraulic Engineer Marvin Chase for a permit to use 20 cubic feet per second of water from the North Fork of Calispell Creek for power purposes and site for power plant. An ultimate development of 600 hp. can be had at the site.

SPOKANE, WASH. — Improvements to be made to the Inland interurban and city traction lines this year will cost $260,000, according to General Manager F. E. Conners. It is the intention of the company to build up its Colfax, Washington and Moscow interurban lines. The sum of $160,000 will go into interurban lines and $100,000 into traction city lines.

SALEM, ORE.—The Oregon public service commission, in an order issued recently, granted in part the application of the Eastern Oregon Power Company for the establishment of a new rate schedule for electric current, with cancellation of all contracts not now conforming to these charges, and reduced the prompt payment discount on lighting bills from 10 to 5 per cent.

FOREST GROVE, ORE.—The city council is considering what to do with the power and light system here. More facilities must be provided. Additional equipment must be secured, and the question is how to buy this machinery at a reasonable figure. A committee has been instructed to investigate a proposition of the Willamette Equipment Co. of Portland, which has equipment at Seattle ready for shipment.

SEATTLE, WASH.—Sealed bids will be received up to June 21 at 10 p.m. for building a reinforced concrete bridge over the Sunnyslope draw, estimated quantities, 696 cu. yds. concrete; 19,000 pounds steel; 550 cu. yds. fill. Also reinforced concrete arch bridge over Elliott river, estimated quantities, 610 cu. yds. concrete; 17,000 pounds steel; 900 cu. yds. fill. Plans and specifications can be obtained at the office of the county engineer for a deposit of $5.00.

SEATTLE, WASH. — George F. Nicholson, city engineer of the Port of Seattle, reports that he, with assistant chief engineer G. W. Whitestone has secured a patent for a portable electric stacking elevator which will greatly decrease the cost of handling cargo, and reports further that a new ship conveyor of exceptional merit is being designed by the engineers and draftsmen of his department. The port commission will then take over the patent and will have it protected.

EUGENE, ORE.—Higher water and electric light rates for Eugene, beginning June 1, have been announced by the Eugene water board. It is no longer possible to postpone a slight revision, says the board, if an adequate depreciation reserve fund is to be provided. Under the new rate the minimum charge will be advanced approximately 20 per cent for all classes in both departments. No other change in rate is contemplated for electric service, but for water, above the minimum charge, the primary rate will be 12 cents per 100 cubic feet a month instead of 10 cents.

SEATTLE, WASH.—The party touring the coast on its way home from the N. E. L. A. convention arrived in Seattle on the morning of June first. After breakfast at the New Washington Hotel, the visitors were taken to the generating plants at Snoqualmie Falls and White River. Luncheon was served at Snoqualmie and at White River and at the Country Club a round of golf was offered the travelers. After a banquet in the evening the visitors were the guests of local men at the Moore Theater. From Seattle they went to Victoria by boat and on to Vancouver where they boarded their special east bound train.

SEATTLE, WASH.—Hearing of the suits brought by the city of Seattle and the Puget Sound Traction, Light & Power Company to enjoin King county from collecting $401,017 taxes assessed in 1919 on the municipal street car lines, in the Superior Court, was begun on June the fourth. The city and the traction company are contending that the street railway property was public property at the time of assessment and therefore not subject to taxation, while the county holds that at the time of assessment, March 15, 1919, the city had not come into title of the lines and therefore the assessment was valid. At the time the city purchased the street car lines from the Puget Sound Traction, Light & Power Company it was agreed between them that in event the taxation was found valid, each should pay a proportion of the tax based on the time the property was in their possession. This would mean that the traction company would pay one-fourth of the tax and the city three-fourths, or approximately $300,000, as it held title to the lines for the last nine months of the year.

THE PACIFIC CENTRAL DISTRICT

ALAMEDA, CAL.—The Eel River was recommended as the most favorable water project by the East Bay Water Commission in its final report to the city council.

LINDSAY, CAL.—Within a few days, work will start on a water reservoir to hold 250,000 gallons.

OXNARD, CAL.—The Ross Construction Company has been awarded the contract for the drainage work of the Oxnard irrigation district.

RED BLUFF, CAL.—A bond election will be held to vote on a water plant and system for this city which is allowed to bond for $160,072.

MERCED, CAL.—The report of the Bear Creek commission contains provisions for raising and spending $9,000 for flood control in a district surrounding Merced, six by eight miles in area.

NEVADA CITY, CAL.—It is reported here that Lake Spaulding, the big storage reservoir of the Pacific Gas and Electric Company, is rapidly filling with water from melting snow. It is stated that the water is now at a stage 17 feet higher than last year with every indication that the reservoir will be well filled.

ALAMEDA, CAL.—The contract for the erection of a sub-station on Webster Street and Atlantic Street was awarded to Palmer and Petersen Contracting Company of San Francisco by the Municipal Electric Light Department. The company's bid was $29,900. The building will be of reinforced concrete and the work will be started at once.

SAN FRANCISCO, CAL.—Samuel Kahn, manager of the Western States Gas & Electric Company, reports that the gross earnings of the company have passed the two-million-dollar mark, as the earnings for the 12 months ended April 30, 1920, amount to $2,027,246, which represents an increase of $316,775, or 18.5 per cent over the 12 months ended April 30, 1919.

MADERA, CAL.—The directors of the Madera irrigation district have determined to proceed at once with the preliminary work of the district. This decision marks a change in the policy of the board, which had previously announced its determination to delay action until the supreme court should have rendered its decision in the case now before it which relates to the Madera irrigation district.

ROSEVILLE, CAL.—The Placer county farm adviser's office reports that Stephen Kieffer, consulting engineer, has reported on the feasibility of several reservoir sites tributary to the American River. These are designed to increase the water supply for the irrigation district that is being organized in the Allen and Roseville farm centers. Kieffer's plan would, it is estimated, harness sufficient water to supply 15,000 acres.

AUBURN, CAL.—County Surveyor Jerome Barieau, accompanied by W. F. McClure, state engineer; Frank Adams of the division of irrigation investigation of the Department of Arriculture, California district; M. Langstaff, supervisor, and Farm Adviser Amundsen are preparing to make an extensive investigation of the French Meadows country to determine the feasibility of a suitable reservoir site to supply water for the Forest Hill Divide.

SUSANVILLE, CAL.—Announcement is made here that the Red River Lumber Company is negotiating for the properties here of the Lassen Electric Company and will probably assume ownership as soon as certain legal adjustments are made. The Red River company is now engaged in installing its own power house on the Feather

River and will be in position to supply nearby points with electrical energy. The plans include the construction of a power line between Westwood and Susanville.

RICHMOND, CAL.—Deeds were filed at the county seat transferring to the Southern Pacific Company a right of way for an electric line from the Alameda county line through Richmond Annex into Richmond. The deeds are from E. J. Henderson, Oakland realty dealer. While no immediate building enterprise is expected from the railway company, the filing of the deeds is taken as an indication that the company ultimately expects to extend the Ninth Street loop into Richmond.

PLACERVILLE, CAL.—The board of trustees has framed an ordinance, adopted at a meeting on June 7, which calls for an election on June 29, when the citizens will be asked to vote on a $30,000 bond issue for the purchase of the distributing plant of the Placerville water works and improvements thereto. The bonds will carry 5½ per cent interest. The trustees plan to spend $10,000 on improvements to the plant and extensions of the water mains. The remainder will be absorbed in the purchase.

SAN FRANCISCO, CAL.—Application for approval by the State Railroad Commission of the purchase of the California Power and Manufacturers Company's holdings on Fall River has been made by the Mount Shasta Power Company, an extension of the Pacific Gas & Electric Company. The price stipulated is $110,902.54. The purchase of the Fall River rights is a step in line with the program of greatly increasing water power facilities and equipment in Northern California, officials of the Pacific Gas & Electric Company announced.

YUBA CITY, CAL.—Following closely an announcement to the rice growers of Sutter county by the Sutter-Butte Canal Company that irrigation ditches would cost $7 an acre, came the announcement from the company that the ditches now would cost $20 an acre, an increase of more than $200,000 in cost to the rice men. The Western Canal Company and the Sutter Water Users' Association joined with the canal company in the announcement. To discuss ways and means of raising the additional $200,000 the rice men have called a conference in Yuba City.

SAN FRANCISCO, CAL.—The Electrical Home in St. Francis Wood, 25 Junipero Serra Boulevard, was opened on Friday, June 11, at an invitational ceremony participated in by city officials, the California Electrical Cooperative Campaign Committee, San Francisco Electrical Development League and Mason-McDuffie Company, agents for St. Francis Wood. John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, presided over the ceremony and Acting Mayor Ralph McLeran was the principal speaker. Following the brief ceremony, visitors were given a demonstration of electricity in the home, such as has never before been witnessed in San Francisco.

VISALIA, CAL.—The San Joaquin Light & Power Corporation has been ordered to pay Tulare county $168,686.81, representing 2 per cent of the concern's gross receipts for the three years ending November 10, 1913, in a decision handed down by Superior Judge Wallace. The decision ends litigation which had been pending for six years. The suit originated under a provision of the statutes that a county should receive 2 per cent of the gross annual receipts of a corporation to which it had granted a franchise for the erection of poles and wires along the public highways. Similar actions to collect 2 per cent of the annual revenues of the San Joaquin corporation for the years subsequent to 1913 are pending in Judge Wallace's court.

THE PACIFIC SOUTHWEST

EL CENTRO, CAL.—The board of directors of the Imperial Irrigation District has rejected all bids received for $500,000 irrigation bonds, and will readvertise.

SAN DIEGO, CAL.—Work on the Barret Dam will not be interrupted as the Spreckels Bros. Commercial Company has agreed to accept bonds in payment for the 25,000 barrels of cement for dam construction.

SAN BERNARDINO, CAL.—Sealed bids were received June 1st by the Board of Water Commissioners for the construction of a pumping basin and pit, in accordance with plans and specifications on file in the office of the board.

PASADENA, CAL.—Plans are under way for the construction of a union depot by the Chamber of Commerce and railroads passing through Pasadena. The idea is to have the Salt Lake, Santa Fe and Southern Pacific, and also the Pacific Electric Railroad occupy one building. The location has not yet been decided.

MIAMI, ARIZ.—Extensive improvements are being made upon the water system here. Over $15,000 of large pipe has been purchased and delivered. A new large reservoir in addition to the present one will be constructed. Improvements are being made under the supervision of T. J. Corcoran of the water system.

PHOENIX, ARIZ.—Claiming an increase in the cost of operation, the Southside Gas and Electric Company has filed its application with the corporation commission for permission to increase its electric rates. The increase asked by the company is 20 cents for residence rates. T. M. Quebedeaux also asked for authority of the commission to sell the Winslow electric plant to the Arizona Electric Power Company.

TUCSON, ARIZ.—The electric district, organized for the distribution of power throughout the new pumping irrigation area lying between Yuma and Dome is rapidly becoming an accomplished fact. Pole lines are up, and the heavy copper transmission wires are being strung. Many wells and a few pumping plants are in readiness. More wells are being drilled and many pumps and motors have been contracted for. This is the first district organization under the electric district law passed by the legislature.

LOS ANGELES, CAL.—The moving picture entitled "That Fairy in the Snowflake," which had its debut at the Pasadena convention, has already achieved an enviable reputation as a film which combines a pretty story with a message. Since its appearance at the convention the picture has had several showings at regular theaters and was also a feature at the Pacific Coast Advertising Clubs convention recently held in Stockton. Many requests for its appearance in the East have been received and it is quite likely that the "Fairy" will soon go on the road for a long and successful career.

EL MONTE, CAL.—The S and H Electric Company, Inc., is the name of a new organization which has just opened an electric shop at El Monte, in the suburbs of Los Angeles. The new concern is also arranging to care for similar business in the neighboring towns of Rivera, Montebello, Pico, Rosemeade and San Gabriel, operating from their present store. R. E. Heerman, for several years manager of the stationery department of the Southern California Edison Company, will be in charge of the new venture. The new company will conduct a general contracting and commercial business.

THE INTER-MOUNTAIN DISTRICT

REXBURG, IDAHO—The city of Rexburg has recently replaced the fifty horsepower motor operating the municipal pump, with a 100 hp. motor.

HUGO, COLO.—Ordinance No. 48 which has recently been passed in this city relates to the installation and inspection of electric wiring and apparatus within the town limits, and creates an electrical inspection department which provides for the licensing of companies, firms, copartnerships, corporations and individuals engaged in the business of electric wiring.

LAUREL, MONT.—Contract has been awarded to Montana Power Company of this city for a lighting system in Special Improvement District No. 2, on a bid of $11,617.

BOISE, IDAHO.—A modern electric pumping plant, to irrigate about 1200 acres of fertile Snake River Valley land, is now being installed. This is known as the Zion irrigation project, and is situated about 40 miles south of Boise, Idaho.

ANCO, IDAHO.—The Burley Electric Company completed the construction of its line to this city on June 1. The manager has stated that it will be ten or fifteen days before 24-hour service is available, as considerable work is necessary on the present system before it is in shape to take care of the additional service.

EUREKA, UTAH.—Electricians are now busy installing electrical equipment at the site of the Tintic Standard Mining Company's new mill near Warm Creek. They will put in a transformer plant and a large amount of electrical machinery before finishing their contract. In connection with the mill there will be an electrically operated tramway and two pumps. The entire mill will be electrically operated.

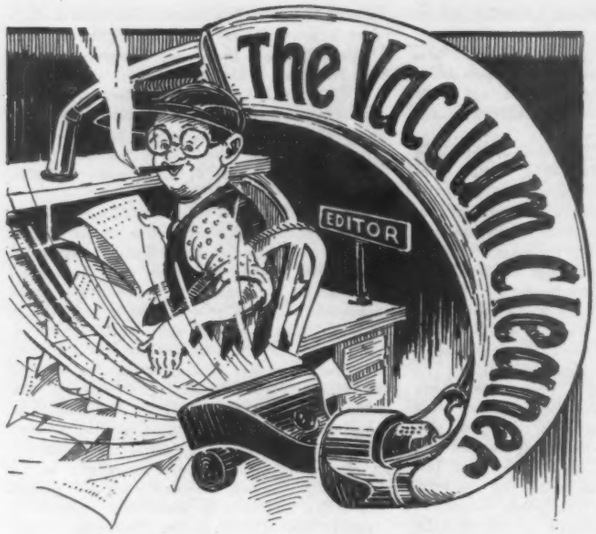
MILFORD, UTAH.—The Telluride Power Company has completed the power line in the irrigation district near Milford, the line running a little more than six miles in a southwesterly direction. The company intends to extend the line as business grows in the territory. The line is three-phase construction, 66,000 volts. There has been installed a separate substation to take care of the irrigation pumping load, the capacity of which is 400 hp.

RED LODGE, MONT.—Work on the new central power house of the Northwestern Improvement Company on the east side is well advanced. Installation of equipment has already begun and the company will shortly move the electrical apparatus from the old No. 2 stone building to the new house. Eventually the power plant of the west side will be transferred to the new site, so that power for the east side and west side mines, as well as for the new No. 3 mine now being opened up, will be furnished from the one plant.

ROBERTS, IDAHO.—The Phoenix Utility Company is working with a large force of men on the power line which is to be extended six and a half miles from the Tughartburg ranch to the Kennedy & Burggraf ranch, where it is to be used to pump water on 2,000 acres of land. After this is completed work will commence on a line around the slough east of town, where two large pumps will be installed on the south bank and the water pumped into a canal which will extend from Roberts to Bassett, to be used for irrigation purposes.

AULT, COLO.—A company of Fort Lupton town oficials were in Ault recently looking over the municipal light and power plant and inquiring as to the degree of satisfaction that it is giving and of its success so far as it has been demonstrated. Lupton receives its service from the Western Light & Power Company, the original source of the current that has been distributed to Ault consumers for years by the Farmers Electric & Power Company of Eaton, and has had some disagreement recently relative to some of the conditions on which the service is to be extended.

STERLING, COLO.—Considerable interest is being shown by farmers of Logan county in the lighting and power plant of the American Electric Light and Power Company, which recently established a factory in Denver, and the machines are now being manufactured and sold. The machine automatically starts when a light is turned on at any part of the farm. It recharges its own batteries and in case of any sort of trouble with the engine gives warning in dim lights and subsequently stops the engine. The owner needs only furnish gas and oil for the gas engine.



A friendly feeling is a business asset when developed to its fullest extent and judiciously applied. A certain coal merchant, a canny Scot, decided that like the quality of mercy it "blesses him that gives and him that takes."

"How is it, Sandy," asked a visitor, "that you quote the lowest prices in town and make reductions to your friends, and yet you can make money?"

"Well, it's this way," explained Sandy in an undertone. "Ye see, I knock off two shillings a ton because a customer is a freen o' mine and then I knock off two hundred weight a ton because I'm a freen o' his."

* * *

The gospel of thrift is gradually being drilled into the American public. We have recently heard of a young San Francisco couple who determined to save their electric light bill, and fed the baby garlic so they could find it in the dark.

* * *

The saturation point in electrical development is not yet, nor have inventors finished improving the earth. A London engineer says that there will come a time when aeroplanes and the X-ray will be primitive and that 500 years hence our descendants will look back upon conditions in 1920 with just such feelings of amused pity as we show for the state of the savages of prehistoric times.

The scientist predicts among other things that in 2420 A. D. all public thoroughfares and parks will be underground, vehicles will be run by wireless, telephones will carry an attachment enabling the speakers to see each other, and all roads will be as smooth as billiard balls.

"When a man sets out for business," he says, "he will not proceed, as he does now, by tramway car or train; he will pass along delightful avenues underneath the surface of the earth. Parks and all other places of public resort and beauty will be roofed in.

"Motor cars and all motor vehicles will proceed by wireless power and not by the crude method of using petrol. They will be fitted up like luxuriously appointed drawing-rooms and will be driven at a rate of 100 miles an hour. Wireless telephones will be installed in the cars, as well as every kind of appointment making for luxury and comfort. Many people will own these cars."

* * *

One's point of view alters one's definition of a word, at least it did when Detroit recently ordered six first aid kits from Chicago the other day and Chicago filled the order with six Pyrene fire extinguishers.

Progress is measured by a backward look, wherefore one of our esteemed contemporaries devotes a small space every day to recalling events of a quarter-century ago. We suggest the following:

Twenty-five Years Ago Today —

You could afford to buy two shoes at a time.
Newspapers didn't always call legislators "solons."
A map of Europe was good for several years.
People had tonsils.
Potatoes were not sold by the cubic inch.
Nobody began sentences with "Before the war" or "During the epidemic."
The streets were safe for pedestrians.
"Dardanella" hadn't been composed.

* * *

True gratitude may be shown in numberless ways. A certain tramp who had been warmed and fed by a kindhearted minister said, on leaving:

"Parson, I can't give you any money. but I know how to fix your gas-meter so it won't register."

* * *

A sound moral is to be deduced from the instance of a certain canvasser who was endeavoring to convince an old butcher of the advantages of electric lighting. "Well!" said the butcher, "I don't know anything about these 'ere units that you keep talking about, but 4d. sounds a lot for one of 'em!"

* * *

COMFORT ANYWHERE

An outlet for every appliance and an appliance for every climate. There is a place for electricity in your home. Make it serve you.

Saving Time the Pierce-Fuse Way

Where time is precious and delay means great loss, pin your faith on Pierce Renewable Fuses for protecting your electrically driven equipment.

Fixed alignment of terminals in the knife blade type is but one of the features of Pierce Fuses which make them the easiest and quickest fuse to renew and return to duty. The rigid terminals of Pierce Fuses insure positive contact at all points along the blades.

We Will Gladly Send You Literature Describing The Unusual Features of Pierce Fuses in Detail

PIERCE FUSE CORPORATION
BUFFALO, N. Y.

Canadian Plant:
The Pierce Fuse Corporation of Canada, Limited, Bridgeburg, Ont.

Pacific Coast Distributors:
Baker-Joslyn Company
Los Angeles San Francisco Seattle

Pierce
Renewable Fuses

Nature's Helpmate

FOR THE PRODUCTION OF POWER

U.S. MOTORS have played an important part in handling the POWER produced by Nature in her mighty resources in Western America. Since 1906 U. S. Motors have given faithful performance of service, proving their supreme strength, rugged stamina and durability in every sort of plant.

If you are interested in reducing upkeep costs and power bills you should write for our literature.

Western Made to Meet Western Standards

U. S. Electrical Mfg. Co.

Third and Central Los Angeles, Calif.

Broad co-operation with every great Electrical Development

Electrification - a Significant Step in Railway Progress
HABIRSHAW
"Proven by the test of time"
Insulated Wire & Cable
Plus Western Electric Company's Service

THIS advertisement which will be read by millions of people in the *Saturday Evening Post*, *Literary Digest*, *Factory*, *System* and *Manufacturers' Record*, is an example of what Habirshaw means by "broad co-operation with every great electrical development."

Habirshaw has discovered that in helping those whom it serves it is helped in turn and industry advances.

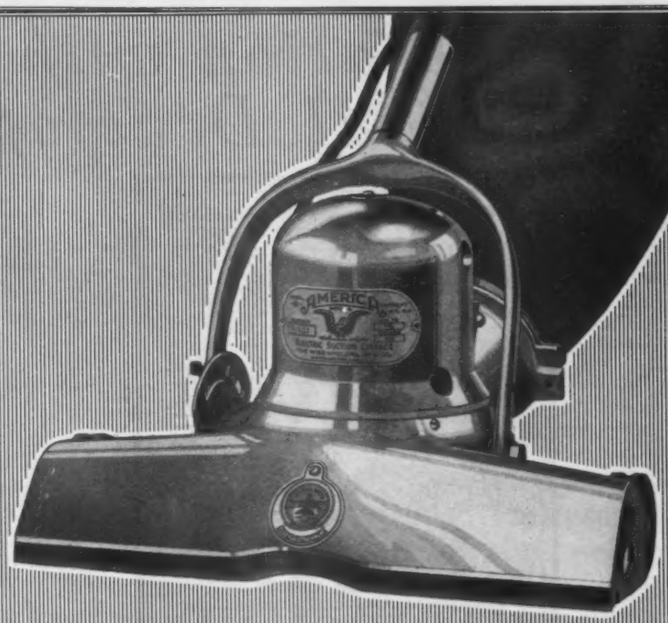
Now it lends its aid to the railroads and traction interests because their need is greatest at present. Transportation companies need increased returns for carrying out improvements and in order to keep pace with the ever-increasing demands of commerce.

Habirshaw believes that the surest way of gaining public acceptance of adequate increases is by emphasizing railway service and its importance to national life. Habirshaw has devoted some of its own advertising space to drive home to the American public a sense of the debt it owes to transportation enterprise.

Habirshaw Wire Manufactured by
Habirshaw Electric Cable Co.
Incorporated
10 East 43rd Street, New York

Habirshaw Wire Distributed by
Western Electric Company
Incorporated
Offices in All Principal Cities

HABIRSHAW
"Proven by the test of time"
Insulated Wire & Cable



ELECTRIC CLEANER-PLUS

EACH exclusive feature of the **America** marks an improvement in electric cleaner design; each contributes to **America** mechanical superiority, convenience and usefulness.

The **America** cleans thoroughly and faultlessly. On rugs, it gently brushes the nap, freshening it, and detaches clinging litter; it removes all surface dirt and embedded grit.

The **America,** designed by engineers who were among the early pioneers in the industry, is built by an organization having had years of experience in the manufacture of electric cleaners. All of which explains **America** mechanical superiority; meaning less servicing for **America** dealers, and uninterrupted service for **America** users. This is why the **America** sells easily.

Write for the America Proposition

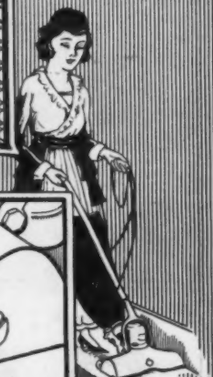
THE WISE-McCLUNG MFG. CO.

480 EIGHTH STREET

New Philadelphia, Ohio

The AMERICA dust bag coupling is operated with one hand. The bag is emptied without scattering contents by standing on coupling lugs and shaking vigorously. An exclusive perfect fitting joint prevents dirt from seeping out at connection.

The AMERICA is run along the side of baseboards to get the close-up dust and dirt, which is drawn by powerful suction thru the arch-shaped openings at either end of the nozzle.



AMERICA

ELECTRIC CLEANER

DUPLEX LIGHTING
A Necessary Refinement

PHONE 4420 UNION

EMIL AMMANN

Dealer in Lighting Fixtures — ELECTRICAL CONTRACTOR — Supplies and Appliances, etc.

405 BERGENLINE AVE.

TOWN OF UNION, N. J. March 30, 1920.

Esq.,
Duplex Lighting Works,
6 West 48th Street,
New York City.

Dear Sir:

The writer believes in giving flowers to the Living and I feel this an opportune time to pass a bouquet on, to the product you represent and also to your good self for teaching me all I know about the Duplexalite. Since my success is to a certain extent your success, the following will be of interest to you.

Starting with October when I first ordered 6 Duplexalites--my sales for the months of October, November and December amounted to an even 38 and this in spite of the fact that I did not make a special effort to push them. After making up my financial statement I was agreeably surprised at the "Profit on Duplexalites" column of my sales book. With this as an incentive, worked in January and sales ran to 53. February a short month showed 59 and March just closed 80. With few exceptions these were all installations of 2 or 3 fixtures in residences. In March we placed an order for 300 Duplexalites and expect to order at least 500 more in April as we now have contracts for installations in 3 large schools, new building, a department store and 2 very large textile mills.

Sorry I did not wake up sooner but am trying my best to make up for lost time. Have just completed a Duplexalite Booth furnished as a room in the home and it is surprising what little talk it necessitates to sell them when shown in this way. Will send you a photo of same as soon as I get them from the Photographer.

Trust this little history will in a way recompense you for the time-patience and energy you have spent in trying to make me see the "Light".

Sincerely

Emil Ammann

Duplex-a-lite is inside

"The light to live with"

Controlling the Huge 75-Ton Gantry Crane at Newark Shipyards

EVERY movement of this 150,000-pound crane which pigmies everything around it, is controlled by the simple manipulation of the C-H Drum Masters in the crane cab.

Here the skilled crane operator with accurate eye controls the hoisting, trolleying and traveling, gauging his starts and stops, getting the maximum results out of this giant steel structure.

Above him in a small enclosure are installed the C-H Magnetic Contactor Controller panels which make possible the control of all the motors from the crane cab Masters.

Because of the great weight of the materials and parts handled, absolute reliability is a primary requisite. No chances could be taken. In conjunction with the engineers at the Newark Shipyards of the Submarine Boat Corporation, the method of control, the protective features and other details were decided upon.

Type "M" Brakes on the Motors

C-H Type M Brakes are also installed in connection with the motors on this crane as well as three on each of the 56 boom hoists in these same shipyards.

C-H Electric Space Heaters Keep the Cab Warm

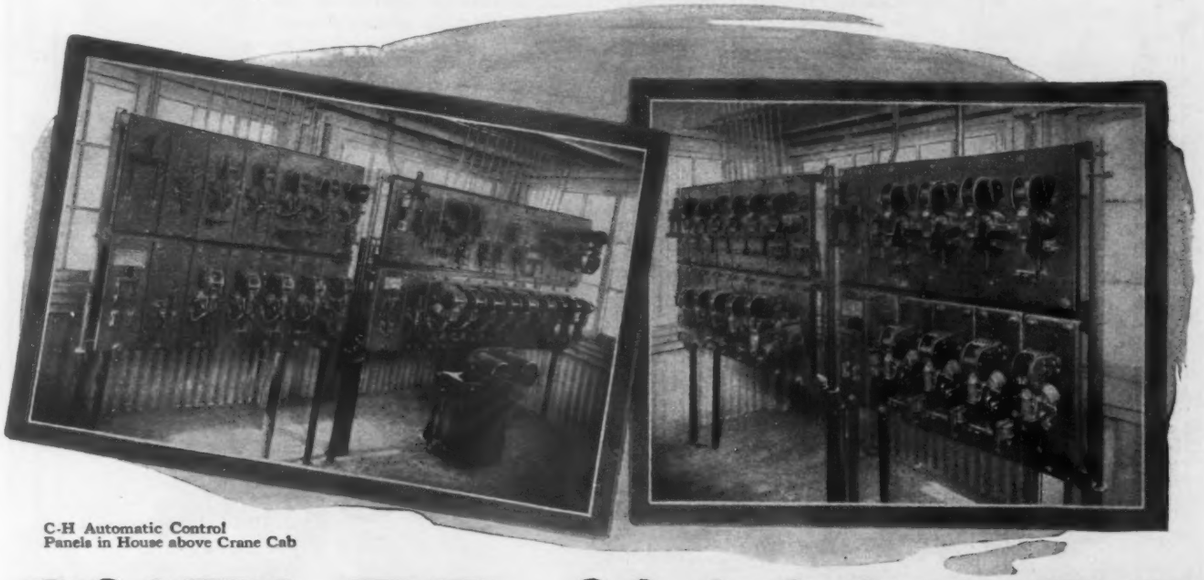
Although the photographer was not able to include the Space Heaters in the view of the cab, the operator said they were a very important part of the equipment. Exposed on all sides and at a height where the wind is most effective, this flexible form of heating makes the cab comfortable, and continuous operation possible.

For information on any C-H product, write the district office nearest you.

THE CUTLER-HAMMER MFG. CO.
MILWAUKEE AND NEW YORK

District Offices: New York: Hudson Terminal Bldg. (50 Church St.); Chicago: 323 No. Michigan Ave.; Pittsburgh: Farmers' Bank Bldg.; Boston: 77 Franklin St.; Philadelphia: Commonwealth Bldg.; Cleveland: Guardian Bldg.; Cincinnati: Gwynne Bldg.; Detroit: 905 Kresge Bldg.

Representatives: H. B. Squires Co., San Francisco: 583 Howard St.; Los Angeles: 206 So. San Pedro St.; Seattle: 552 First Ave. So.; General Machinery Co., Birmingham, Ala.: Brown-Marx Bldg.; H. L. Vaughan, Denver: 1710 Glenarm St.; L. Brandenburger, Salt Lake City: 59 West Broadway.



C-H Automatic Control Panels in House above Crane Cab

CUTLER-HAMMER

Good Light Lightens Labor

LIGHTING the kitchen is like lighting a factory. Good lighting quickens "production," as the factory man would say. In other words, it makes work go faster without the expenditure of any more energy.

Of all the places needing more light and better light, the kitchen in most homes is one of the most important. And when you have doubled or trebled the light in your work rooms, try it also in your living rooms.

If you find that doubling or trebling the illumination there means glaring light, don't cut down the amount of lighting again—shade the light better. Keep the direct rays from striking the eye. Throw some of the light to the ceiling and walls.

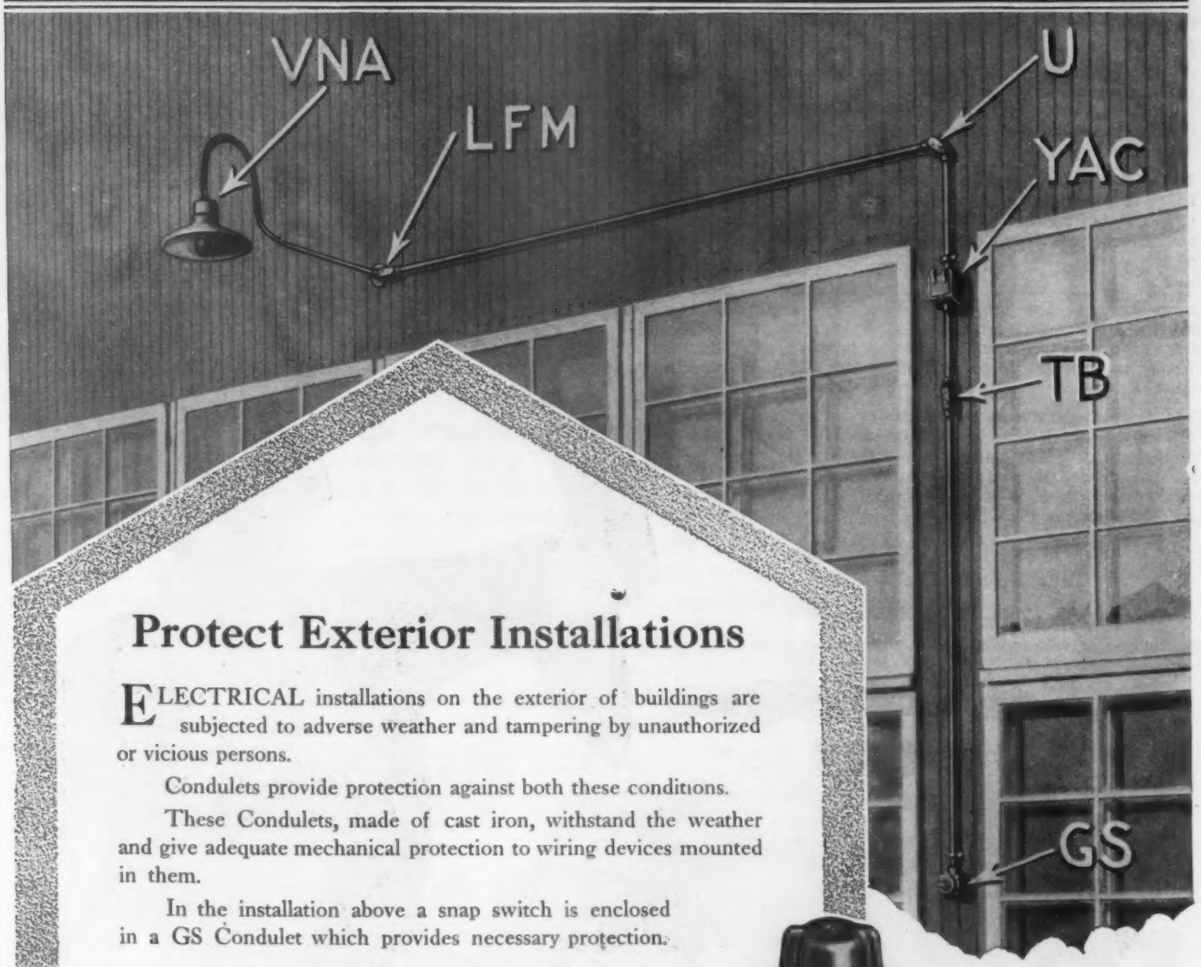
If you will do that, you will find that a great deal more light in the room is decorative, pleasing and restful. It's not the amount of light that you find irritating in some rooms, but the amount of glare. Insist on buying lamps packed in the Blue Convenience Carton.

This page advertisement in colors in the Saturday Evening Post of June 19 will increase the prestige of National MAZDA Lamp distributors. Be sure to let the people in your community know that YOU can supply them with more light and better light for their homes.

NATIONAL LAMP WORKS
of General Electric Company
Nela Park, Cleveland, Ohio

Each of these labels represents a division of National Lamp Works equipped to give a complete lighting service

CONDULETS



Protect Exterior Installations

ELECTRICAL installations on the exterior of buildings are subjected to adverse weather and tampering by unauthorized or vicious persons.

Condulets provide protection against both these conditions.

These Condulets, made of cast iron, withstand the weather and give adequate mechanical protection to wiring devices mounted in them.

In the installation above a snap switch is enclosed in a GS Condulet which provides necessary protection.

CROUSE-HINDS COMPANY

SYRACUSE, N. Y.

BOSTON NEW YORK CHICAGO

Condulets Panelboards
Knife Switches Floodlights
Guy Anchors

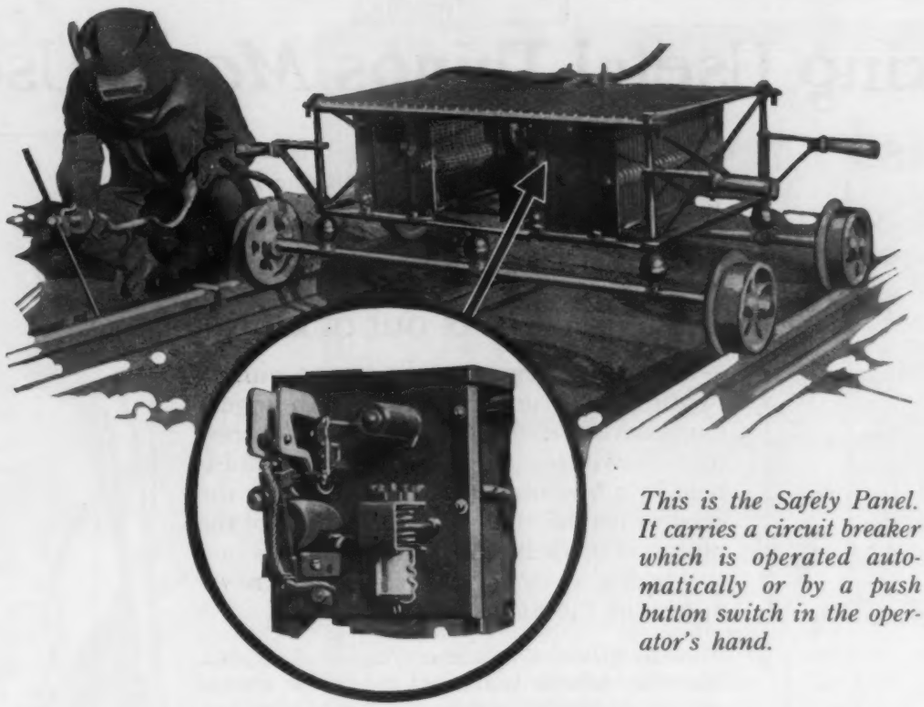
1560

GS CONDULET

Type GS Condulets provide water, gas, steam and dust-tight enclosures for the ordinary commercial type of snap switch with wing handles.

Condulet the Job

CROUSE-HINDS



This is the Safety Panel. It carries a circuit breaker which is operated automatically or by a push button switch in the operator's hand.

O-B Arc Weld Bonding

Saves Time and Trouble At EVERY JOINT

You'll find features that make for speed and convenience in both the O-B Arc Weld Bond and Welding Machine.

"Steel to Steel with Steel" is the easiest electric welding—and that is the way O-B Arc Weld Bonds are installed.

The O-B Bond makes a 90° angle with the rail. In any less angle it is not possible to reach the bottom with the electric arc.

The operator controls the O-B Arc Welding Machine by a push button switch right in hand on the electrode cable. He cuts the machine in or out of the line without even changing position.

An automatic circuit breaker kicks out in case of an overload or short circuit.

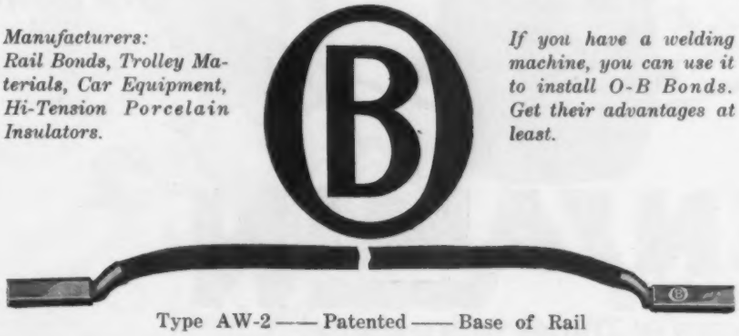
Send for Illustrated Booklet

The Ohio Brass Company, Mansfield, Ohio

New York Philadelphia Pittsburgh Chicago San Francisco Los Angeles

Manufacturers: Rail Bonds, Trolley Materials, Car Equipment, Hi-Tension Porcelain Insulators.

If you have a welding machine, you can use it to install O-B Bonds. Get their advantages at least.



Type AW-2 —— Patented —— Base of Rail

O-B Type AW3
Patented Ball of Rail

BENJAMIN PRODUCTS

Making Useful Things *More* Useful

In Industry

AMONG the many "Things More Useful," a small but important one is the Benjamin 903 Swivel Attachment Plug. Wherever there is an electrical appliance there is a place for one of these handy little plugs.

It Keeps Kinks out of Cords

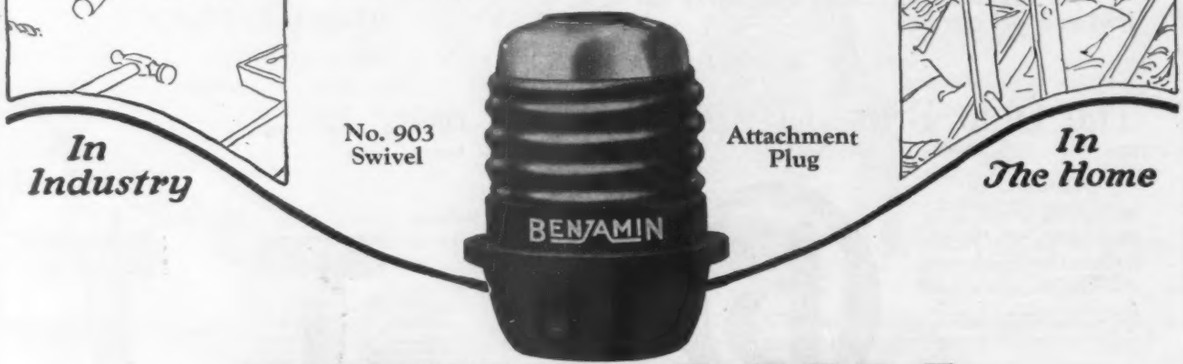
—because it screws into the socket without twisting or turning the cord. An ingeniously devised shell which contains the screw threads swivels upon the plug proper and is held by a bushing from slipping up on the cord—thus the shell is the only part of the plug that turns and the plug itself goes into the socket as straight as a bayonet, never disturbing the cord or the appliance.

There are 903 Swivel Attachment Plugs for all purposes, from heavy asbestos heater cord and flexible armored cable to the smallest cord in use—plain or reinforced. All 903's fit Edison Screw Base Sockets or Receptacles.

Remember the standard, in our millions of homes, is the Edison medium screw base, whether in lamp sockets or wall receptacles. The Benjamin 903 Swivel Attachment Plug fits any Edison Screw Base Device. It is the least complicated, the easiest to use, and the logical Plug with which to equip an electrical appliance.

For information, write the Advertising Department
806 W. Washington Blvd., Chicago

BENJAMIN ELECTRIC MFG. CO.
Factories: Chicago and Desplaines, Ill.
Sales and Distribution Offices:
247 W. 17th St., New York 806 W. Washington Blvd., Chicago
580-582 Howard St., San Francisco
Benjamin Electric Mfg. Co. of Canada, Ltd., Toronto, Canada
The Benjamin Electric, Limited, London, England



In The Home

BENJAMIN

Makers of Things More Useful

Quality First—and Last

WHETHER we make one a day or one thousand, every Royal Cleaner must be the best that we can produce.

No demand for increased production is ever allowed to lower the quality standard that has given the Royal its prestige.

The overwhelming demand for the Royal is a significant recognition of its merit. The fact that neither our production nor our policy will permit us to supply all dealers, places the dealer who has the Royal franchise in an enviable position. He has something that not only is hard to secure, but is well worth having.

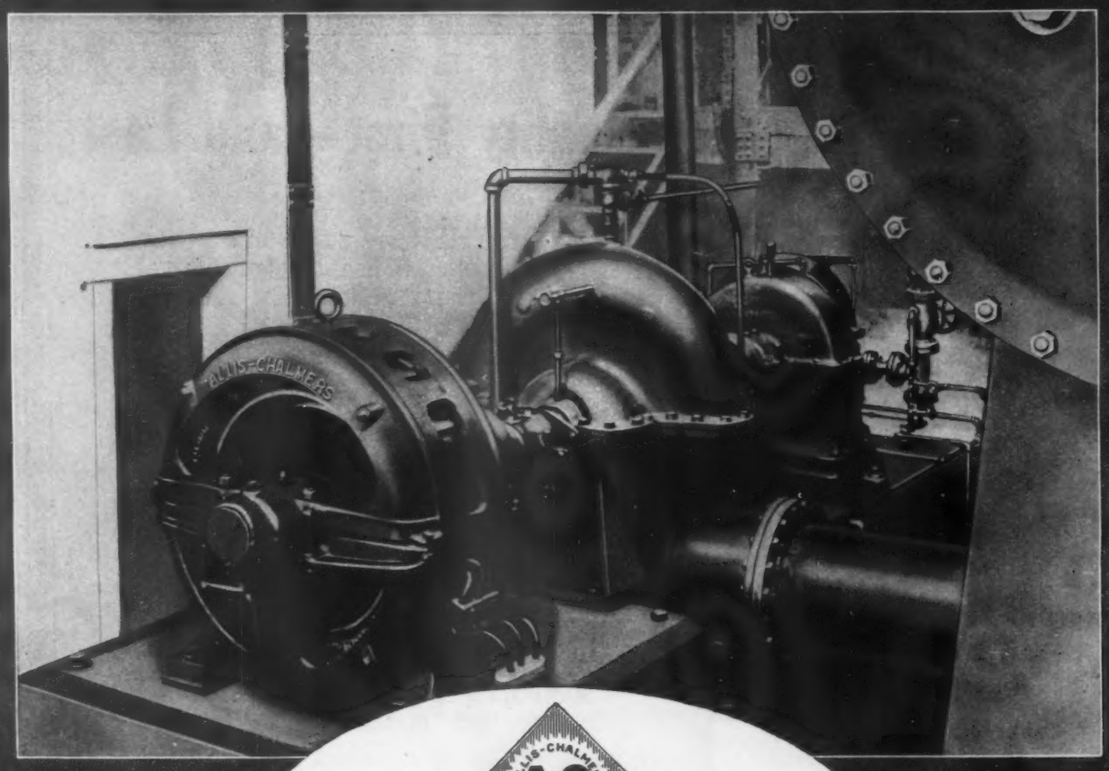
The P. A. Geier Company

5116 St. Clair Avenue

Cleveland, Ohio

ROYAL
QUALITY SERVICE
ELECTRIC CLEANER

Cleans by Air-Alone!



Circulating Pump with motor and impulse turbine drive

This Allis-Chalmers Centrifugal Pumping Unit, installed in the American Public Utilities Co.'s plant, has two kinds of drive, permitting the pump to be driven direct by the motor from one end or through gears by an impulse turbine on the other end. It is a 20-inch, type "S" Allis-Chalmers circulating pump, 10,500 G.P.M. working under a 25-foot head, and like all Allis-Chalmers pumps is giving satisfactory service.

Not only do Allis-Chalmers pumping units possess every improvement in design and construction, but they have a big advantage over other units—the pump and motor are built by the same concern. This centers all responsibility for satisfactory operation in one concern.

Our Engineering Department will gladly assist on any pumping problem. We build a complete line of Pumping Machinery and are pleased to send Bulletins on any special type of pump upon request.

Allis-Chalmers Mfg. Co.
Milwaukee, Wisconsin

ANACONDA

BARE COPPER WIRE AND CABLE

Known In The Four
Corners Of The
Earth

A corps of experts is in charge of the mammoth plant at Great Falls, Montana, equipped to produce "pure" copper wire and cable in sufficient quantity to meet the needs and requirements of electrial development.

When you specify Anaconda Copper you receive a product containing less than 1/100 of 1% metallic impurities.

ANACONDA COPPER MINING CO.
Rolling Mills Department
General Office,
111 W. Washington St., Chicago, Ill.

EXCLUSIVE SELLING AGENTS FOR THE PACIFIC COAST.

Pacific States Electric Company

San Francisco Los Angeles Oakland
Portland Seattle

ANACONDA
BARE COPPER WIRE AND CABLE

"From Ore To Finished
Product"

Made the HUBBARD WAY

Hubbard & Co.

Pittsburgh

No. 231

No. 137

PEIRCE

Presteel Spreaders and Break Arms

Will not break, bend or pull off your arms and can be installed in a minute.
Hot galvanized–pressed from No. 9 guage steel.
Strong enough to take the strain of your largest and heaviest services.

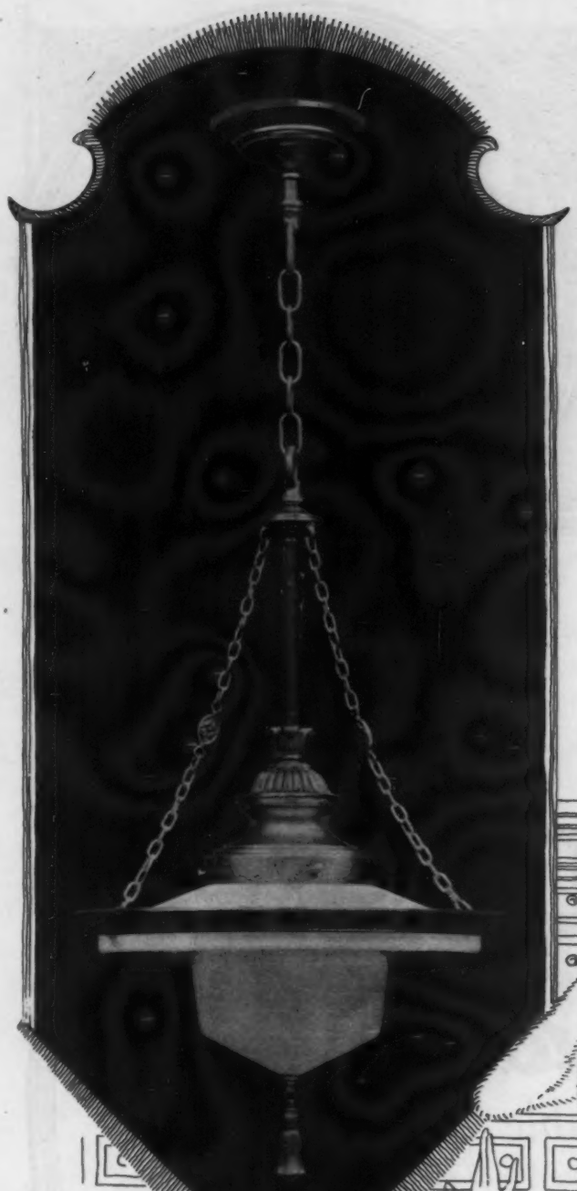
For further details write our

DISTRIBUTORS FOR THE PACIFIC COAST

Pacific States Electric Company.

San Francisco Los Angeles Oakland Seattle Portland Spokane

"the hardware makes the line. Hubbard makes the hardware"

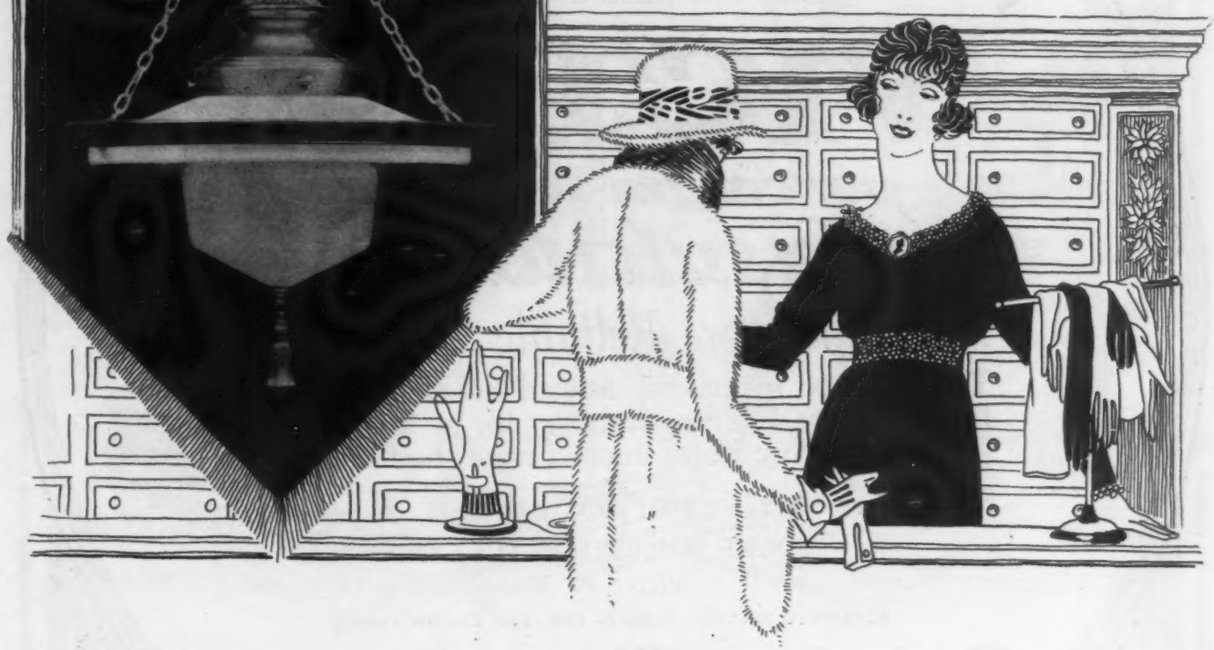


Enterprising Merchants

Recognize the value of service to customers expressed in terms of proper illumination.

THE IVANHOE ACE

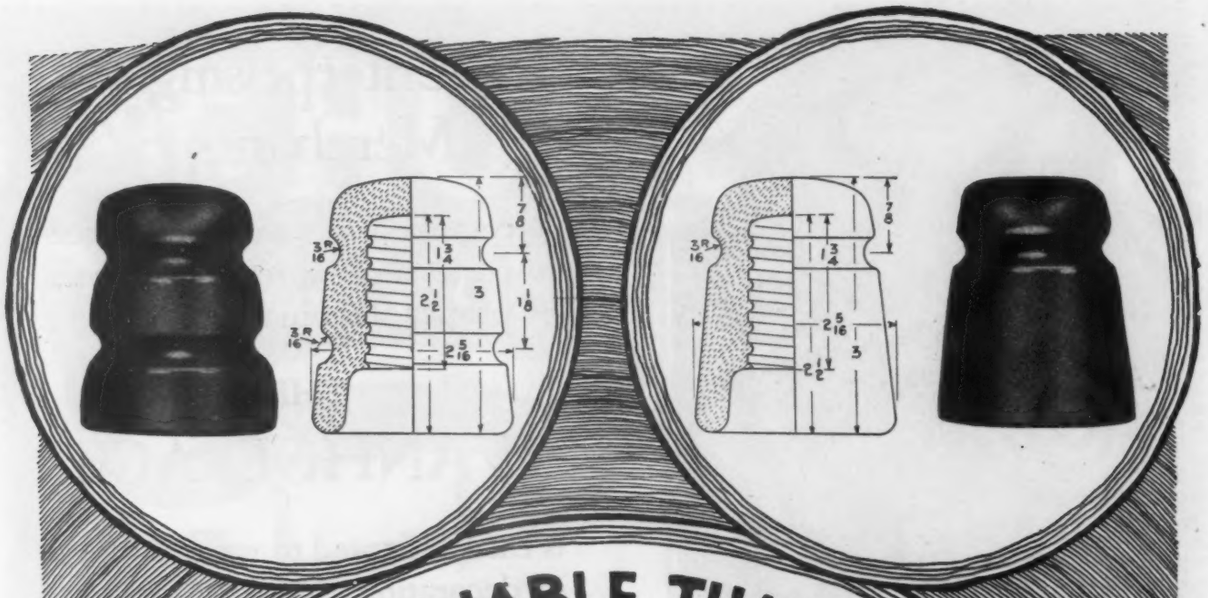
is easily adapted to various types of decoration, and is selected by discriminating merchants where a highly efficient unit of low maintenance cost is desired.



Distributors for the Pacific Coast

Pacific States Electric Company.

San Francisco Los Angeles Oakland Seattle Portland Spokane



MORE RELIABLE THAN GLASS

Exhaustive investigation and constant study of conditions have convinced us that these

VICTOR

porcelain telephone

Insulators

Are Far More Reliable Than Glass

These Victor Insulators, as well as all other Victor Insulators are tested to flashover for at least five minuets before being shipped from the factory.

Stocks are carried in Pacific Coast warehouses.

LOCKE INSULATOR MFG. CO.
Victor, N. Y.

EXCLUSIVE SELLING AGENTS FOR THE PACIFIC COAST.

Pacific States Electric Company.

San Francisco Los Angeles Oakland

Seattle Portland

Spokane

When Safety Pays

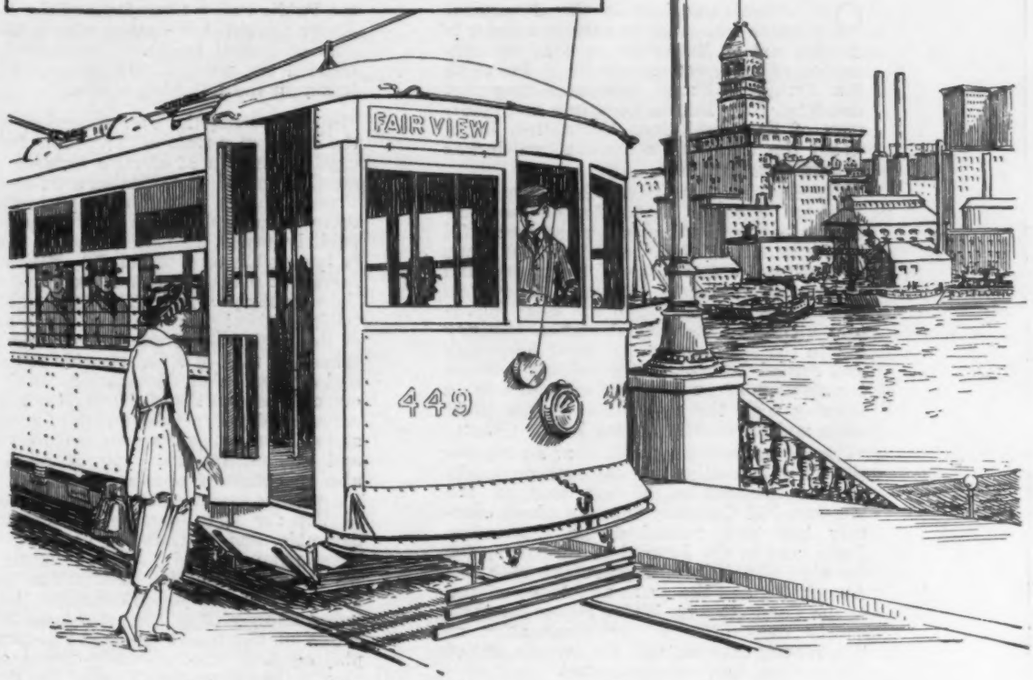
When physical disability results any accident, whether in collision or otherwise, is always unfortunate and most regretable.

The Birney Safety Car not only eliminates many serious accidents, but looking at it from a cold financial viewpoint it saves money to the operating company. Following is an extract taken from the Terre Haute Spectator of May 1st last:

> "Shortly after the new cars were placed in service here it was reported that for the first time in six years the traction company was not paying the bill of someone at the hospital."

Boarding and alighting accidents which have always been common are rare on Birney Safety Cars.

BIRNEY TRADE MARK SAFETY CAR



THE J. G. BRILL COMPANY
PHILADELPHIA, PA.

AMERICAN CAR CO. ST. LOUIS MO. — G. C. KUHLMAN CAR CO. CLEVELAND, OHIO. — WASON MANF'G CO. SPRINGFIELD, MASS.

The Spotlight Is On The

The National Electrical Mind the Journal of Electricity is

A List of Some of the Complimentary Remarks Said About the Journal of Electricity and Its Companion Papers at the Recent Convention of the National Electric Light Association at Pasadena, May 17 to 22, 1920, and of the Electrical Supply Jobbers' Association at Del Monte, May 11 to 14, 1920

ON several occasions in the discussions allusion was made to various articles in the Journal of Electricity, and at the conclusion of the great convention at Pasadena Mr. Arthur Williams, General Manager of the New York Edison Company and chairman of the Resolutions Committee, introduced the following resolution, which was unanimously passed:

"Whereas, The forty-third convention of the National Electric Light Association now ending has been one of the most successful in the annals of the Association, not alone in the breadth and scope of the papers and reports submitted by various authors and committees bearing upon the most important phases of the central station industry but in the spirit of cordial good fellowship and cordial interest in the welfare and entertainment of each of the delegates so in keeping with the reputation of this great state and community on the Pacific Coast;

"Therefore, be it Resolved, That an expression of appreciation and the sincere thanks of the Association be extended to the McGraw-Hill Company through whose courtesy has been published the Convention Daily, and to the Journal of Electricity for its able and helpful cooperation with the Association and the great assistance offered to the Committee on Water Power for their hearty cooperation in the preparation of this report, the map and the compilation of the western data here presented."

* * *

The following is an extended excerpt from the report of John A. Britton, chairman of the Public Policy Committee of the National Electric Light Association, who in the presence of a vast audience impressively commended the work of the Journal of Electricity in the following terms:

"In confronting the ever recurring wave of the desire of certain of the people for municipal ownership of electric lighting plants, members of this Association are faced at all times with the misleading reports made by those municipalities in the possession of publicly-owned plants. For that reason it is impossible to contrast the efficiency and service of privately-owned plants as against those publicly owned. The Journal of Electricity, published in San Francisco, and one of the McGraw-Hill publications, has undertaken the task of a nation-wide research to find out just what Commissions of the various commonwealths of the country are today empowered to supervise standard accounting and statements, both among privately-owned and municipally-owned power plants, and also to obtain if possible an opinion from the various Commissions as to whether unification for such accounting systems seems desirable, and to that end has projected a questionnaire which, when properly compiled, will give the information desired. It is the belief of your Committee that such information will do more towards the education of the public as to the necessity of playing fair with privately-owned electric plants, than any other plan of utilities, and assist in dispelling the general impression that publicly owned plants can be conducted more economically than those under private

Journal of Electricity

Sees the Genuine Service Rendering to the West

ownership. In this connection your Committee desires to commend most heartily this public spirited work of the Journal, which spells in real capital letters 'Cooperation.' There is no menace facing our industry today that will tend to its disintegration more rapidly and surely than will the attempts of municipalities to dissipate the securely bound together organizations that spell for the public 'service and economy.'"

* * *

The report of the Water Power Development Committee of the National Electric Light Association at the Pasadena Convention proved to be the most remarkable document presented at that convention, and is declared by John A. Britton and others familiar with this important present day subject to constitute the most authoritative compilation of data yet published on the subject of water power. When presenting his report to the convention, Franklin T. Griffith, president of the Portland Railway, Light & Power Company and chairman of the Water Power Committee, had the following to say: "Particular credit is to be accorded Mr. Robert Sibley, editor of the Journal of Electricity and Pacific Coast editor of Electrical World, and the members of his staff for their hearty cooperation in the preparation of this report, the map and the compilation of the western data here presented."

* * *

The following is a resolution passed by the Pacific Coast Section N. E. L. A. in session at Pasadena, May 17, 1920:

"**Resolved,** That this association tender to the Journal of Electricity and its editorial staff its hearty commendations for the work that it has done for the industry during the past year, and more particularly for the powerful contribution it has made in connection with the Water Power Committee's Report that is to be presented to the National Electric Light Association convention this week;

"**And be it further Resolved,** That the Pacific Coast Section is especially indebted to Mr. Robert Sibley for the time and energy which he has devoted to the promotion of its interests."

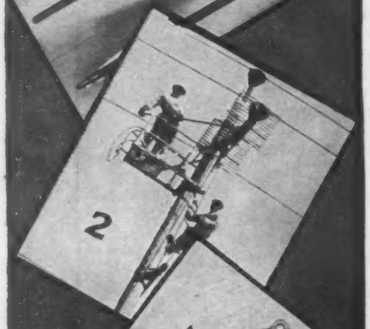
* * *

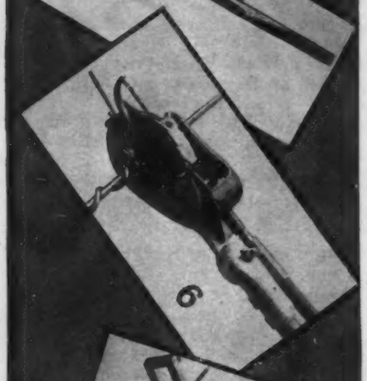
Among the resolutions passed at the convention of the Electrical Supply Jobbers' Association at Del Monte—May 12th to 15th—were those commending W. M. Deming and the McGraw-Hill Electrical Trio for the committee work undertaken by the various members of the staff in forwarding the convention activities, among which was the illustrated lantern slide lecture given as the evening feature of the convention by Robert Sibley, editor of the Journal of Electricity, who is also Pacific Coast editor of Electrical World and Electrical Merchandising. This feature consisted of the setting forth of notable engineering achievements and the triumphs of the method electrical in the far West, where the per capita use of electricity is more intensive than in any other district of the world.

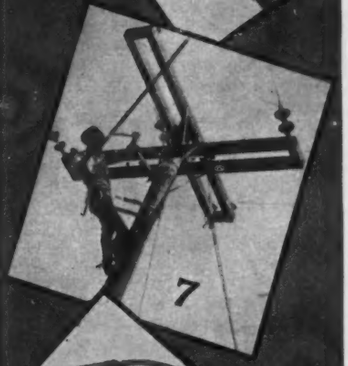
Western manufacturers' agents and representatives should capitalize now the insight their manufacturers acquired at the conventions concerning the tremendous possibilities of the West and the advertising power of the Journal of Electricity. Let us help you prepare the plan and copy that will aid in solving your sales problems in the West.

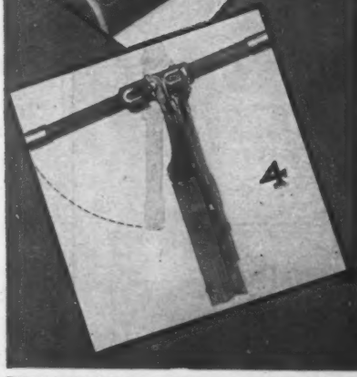
BUSH

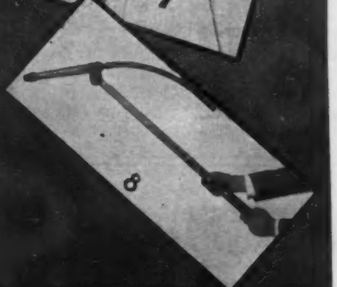
SAFETY TOOLS











Making Line Construction Safe

Ninety per cent of the accidents that happen to linemen and other electrical men would be eliminated by the use of the proper safety tools. Accidents, especially on high voltage lines are very often serious and costly to the Central Station.

During the eighteen years that Mr. Bush had been in the power engineering work he often had occasion to witness accidents that happened because of the lack of safety tools. The need for safety tools so impressed him that he organized a company and started to develop absolutely safe, yet mechanically rugged safety tools.

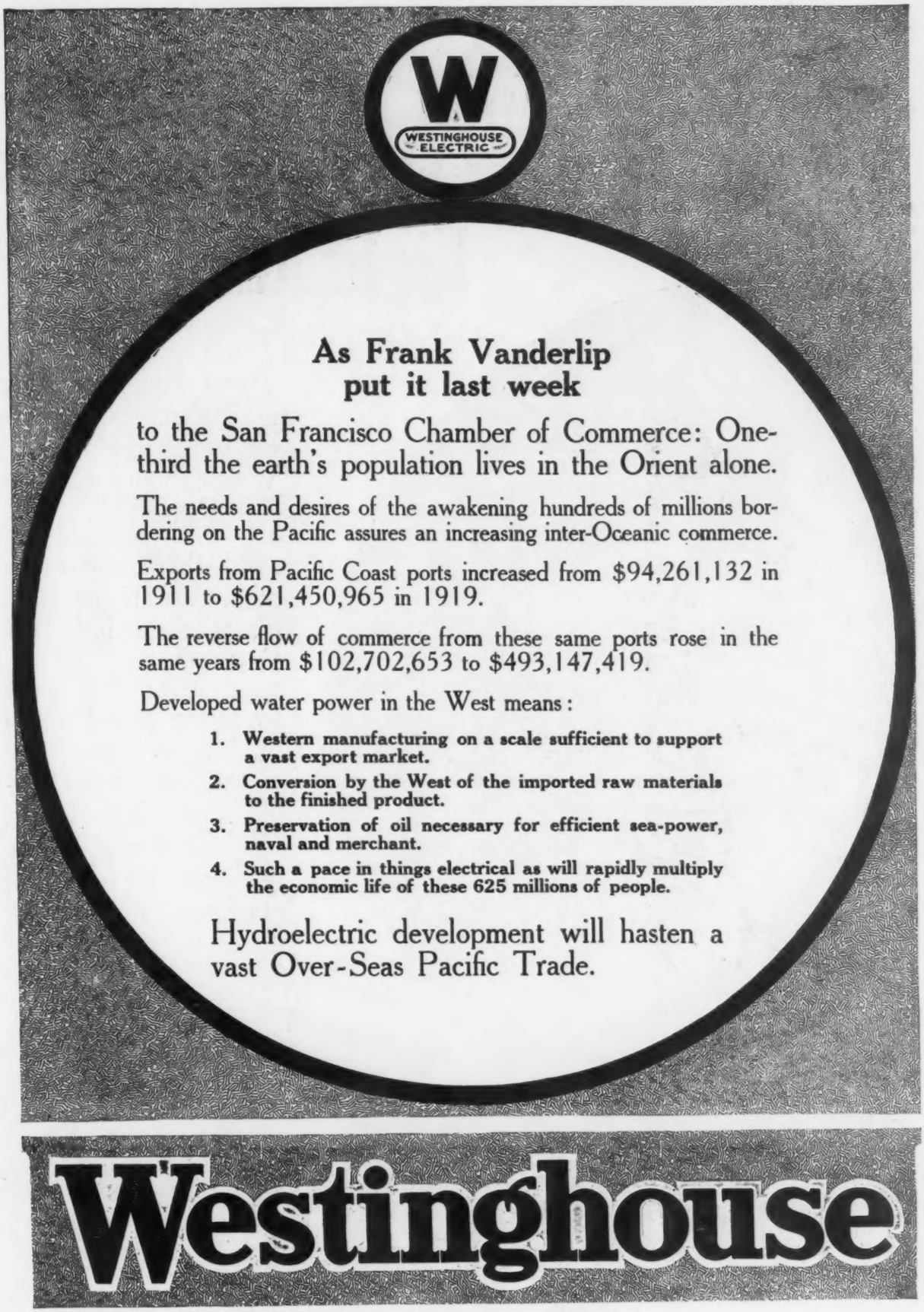
Bush safety tools are now being used throughout the Pacific states and repeat orders are coming in daily. They are heartily indorsed by many big Central Stations because they are rugged, lasting, economical and safe.

Our Catalogue A explains in details what each tool can do. Adopt safety tools on your line.

1 Folding Tree Saw
2 Staging and Guards on 55,000 volt line
3 Wire Pulling Clamp
4 High Voltage Fuse Grabber
5 Two-gear Tree Trimmer
6 Hot Tapping Machine
7 Hot Wire Cutter
8 Air Nozzle and Handle

THE BUSH ELECTRIC CO.

CLEVELAND, OHIO.


W
WESTINGHOUSE ELECTRIC
As Frank Vanderlip put it last week
to the San Francisco Chamber of Commerce: One-third the earth's population lives in the Orient alone.
The needs and desires of the awakening hundreds of millions bordering on the Pacific assures an increasing inter-Oceanic commerce.
Exports from Pacific Coast ports increased from $94,261,132 in 1911 to $621,450,965 in 1919.
The reverse flow of commerce from these same ports rose in the same years from $102,702,653 to $493,147,419.
Developed water power in the West means:
1. Western manufacturing on a scale sufficient to support a vast export market.
2. Conversion by the West of the imported raw materials to the finished product.
3. Preservation of oil necessary for efficient sea-power, naval and merchant.
4. Such a pace in things electrical as will rapidly multiply the economic life of these 625 millions of people.
Hydroelectric development will hasten a vast Over-Seas Pacific Trade.
Westinghouse

Westinghouse

COMPLETE POWER PLANT AND LINE EQUIPMENT

Light and Power

These men and over 30,000 more with them are toiling daily at the Westinghouse plant at East Pittsburgh.

And there are many other Westinghouse plants throughout the East.

From the generating of the biggest power units to the latest labor saving devices in the home, Westinghouse quality is making for electrical efficiency in the West.

Westinghouse

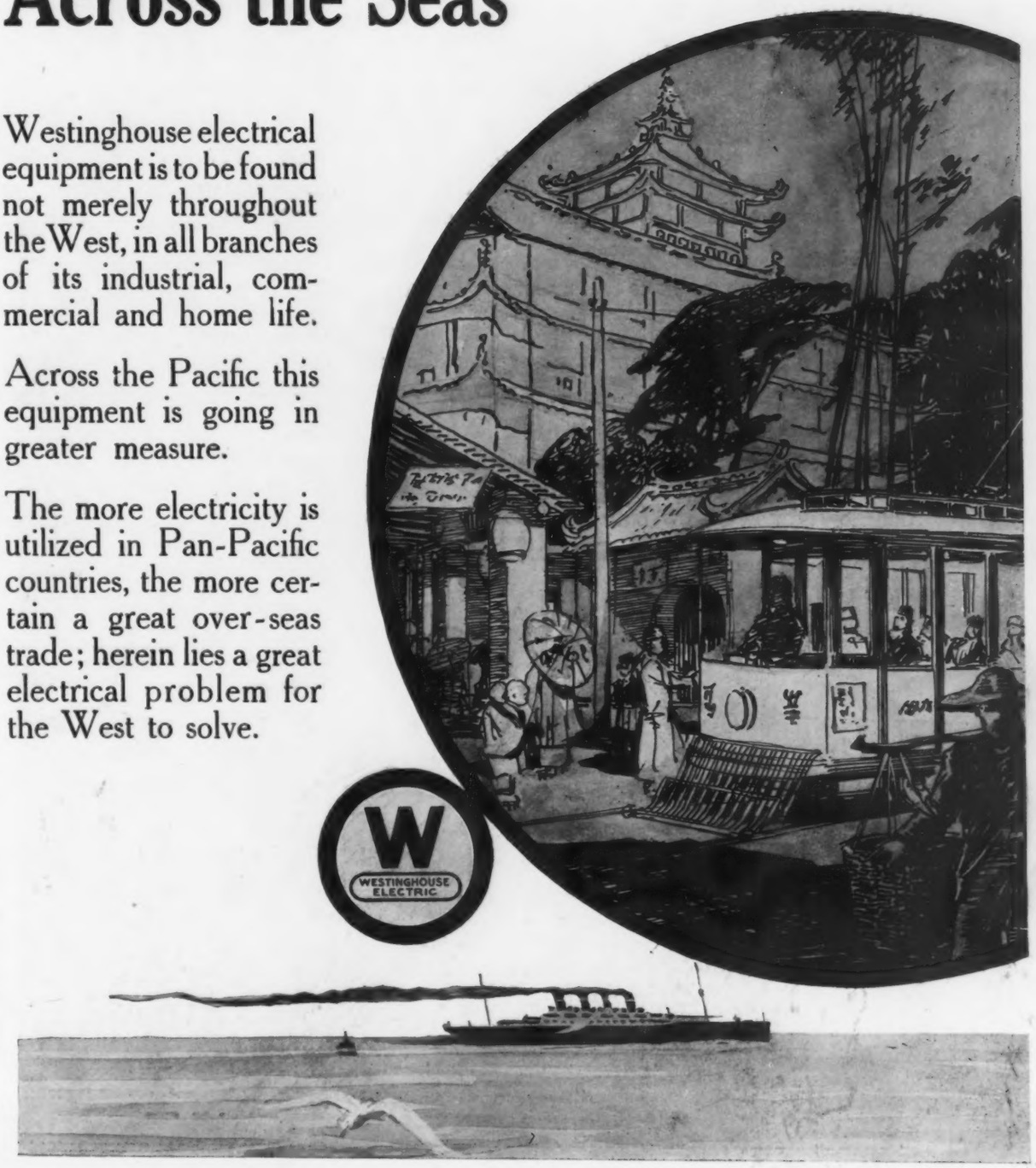
ELECTRIC MOTORS AND CONTROLLERS

Across the Seas

Westinghouse electrical equipment is to be found not merely throughout the West, in all branches of its industrial, commercial and home life.

Across the Pacific this equipment is going in greater measure.

The more electricity is utilized in Pan-Pacific countries, the more certain a great over-seas trade; herein lies a great electrical problem for the West to solve.



The Home Electrical in Pan-Pacific

This remarkable Westinghouse Automatic Electric Range enables the family to motor where and when it wants to.

For electricity, regulated by the clock on this range, automatically, without assistance, has the dinner fully prepared at the time set for return.

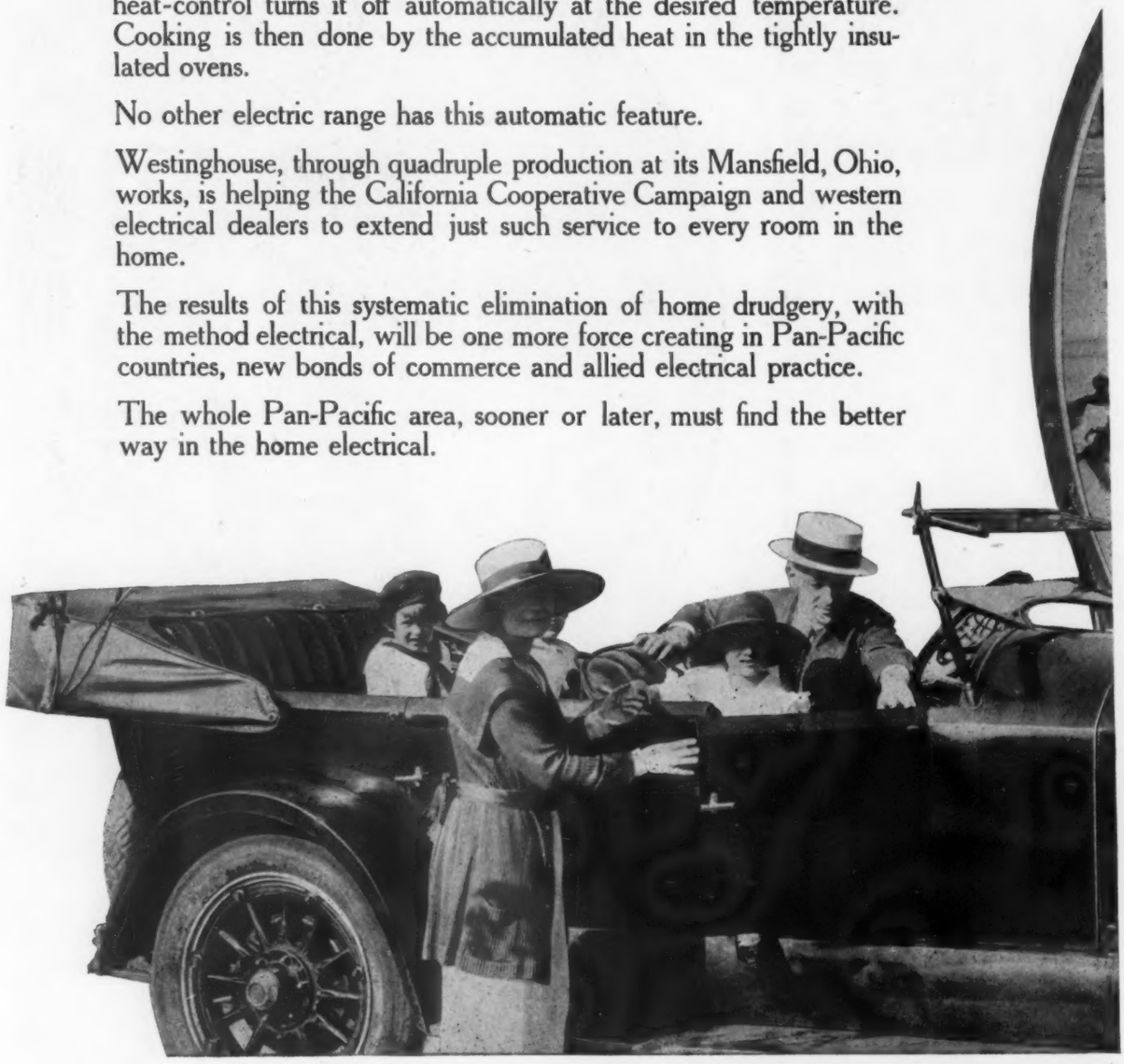
The clock turns on the current automatically at the hour set. The heat-control turns it off automatically at the desired temperature. Cooking is then done by the accumulated heat in the tightly insulated ovens.

No other electric range has this automatic feature.

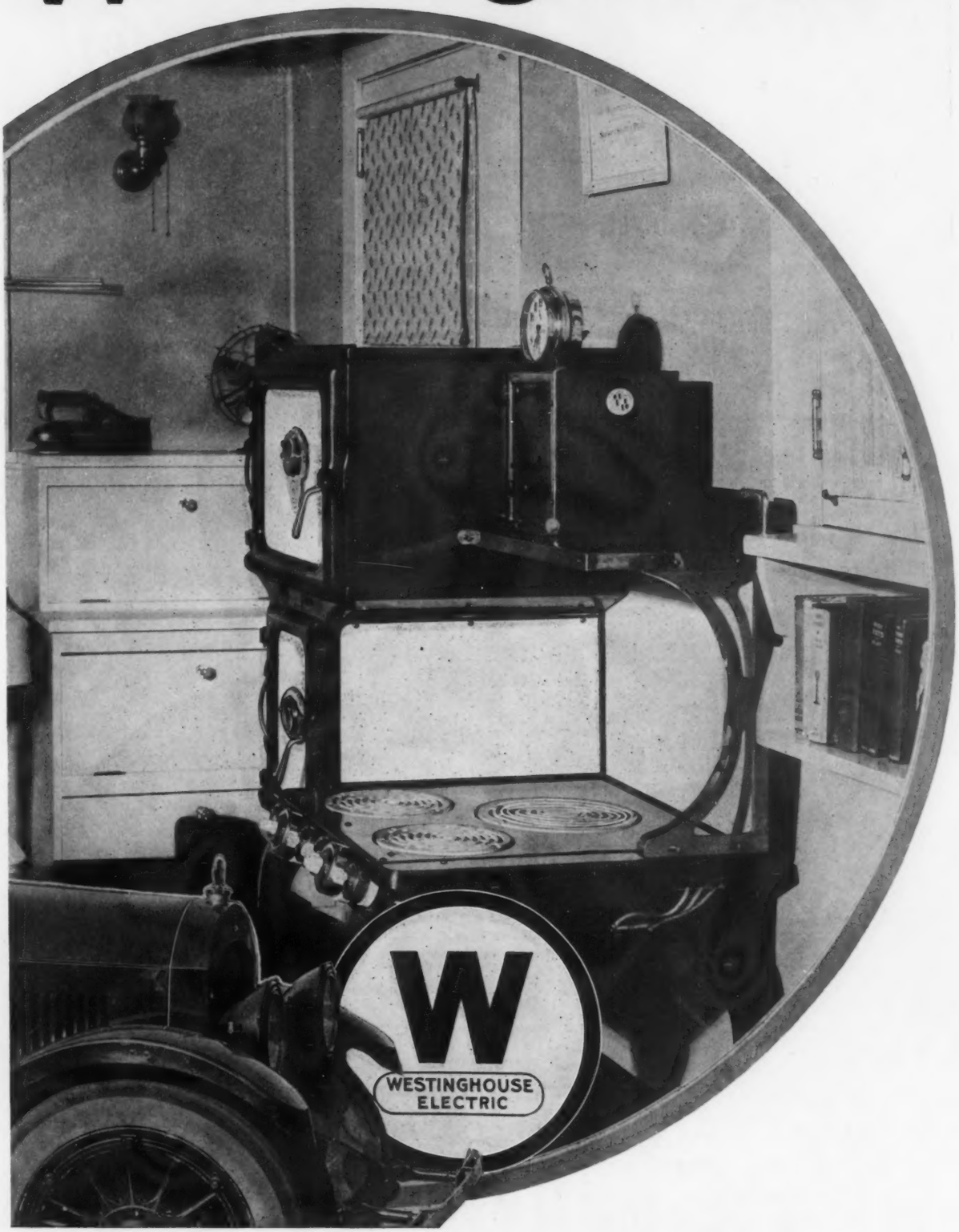
Westinghouse, through quadruple production at its Mansfield, Ohio, works, is helping the California Cooperative Campaign and western electrical dealers to extend just such service to every room in the home.

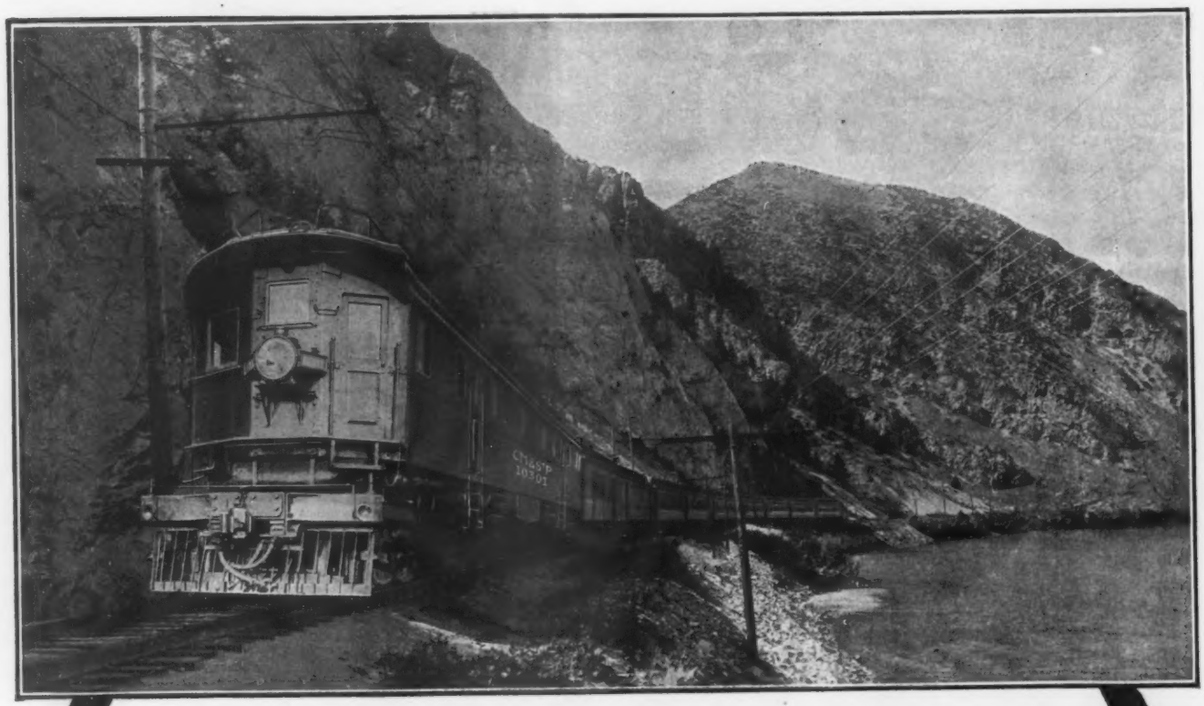
The results of this systematic elimination of home drudgery, with the method electrical, will be one more force creating in Pan-Pacific countries, new bonds of commerce and allied electrical practice.

The whole Pan-Pacific area, sooner or later, must find the better way in the home electrical.



Westinghouse





The Most Powerful Locomotive in the World for Passenger Service

For the Rocky Mountain Electrification of the Chicago, Milwaukee & St. Paul Railway

CHARACTERISTICS:

Total Weight of Locomotive	275 Tons
Weight, Electrical Equipment	199000 Pounds
Weight, Mechanical Equipment	351000 Pounds
Weight, Oil, Sand and Water	42250 Pounds
Weight on Driving Wheels	336000 Pounds
Number of Driving Axles	6
Weight on Leading Bogie Truck	66000 Pounds
Weight on Trailing Pony Truck	41000 Pounds
Total Wheel Base	79 ft.-10 in.
Driving Wheel Base	16 ft.- 9 in.
Rigid Wheel Base	16 ft.- 9 in.
Diameter of Driving Wheels	68 Inches
Diameter, Bogie and Trailer Wheels	36 Inches
Capacity—One Hour Rating	4200 H.P.
Capacity—Continuous Rating	3400 H.P.
Tractive Effort—One Hour Rating	66000 Pounds
Tractive Effort—Continuous Rating	49000 "
Speed—Maximum	65.0 M. P. H.
Capacity of Steam Heating Boiler	4000 Lbs. P. H.
Capacity of Oil Storage Tanks	750 Gallons
Capacity of Water Tanks	25250 Pounds
Height from Rail to Top of Cab	14 ft.-6 in.
Height from Rail to top of Locked Pantagraph	16 ft.-8 in.
Height from Rail over Heating Boiler Stack	17 ft.-0 in.
Width Over Cab	10 ft.-0 in.
Length of Cab	78 ft.-0 in.
Length Overall	88 ft.-7 in.
Voltage of Trolley	3000. D. C.
Normal Height of Trolley Wire	24 ft.-2 in.
Gauge	4 ft.-8½ in.

Locomotive Equipped With:—
Automatic Forced Ventilation, Westinghouse System Regenerative Braking,
Westinghouse Electro-pneumatic Control,
Westinghouse Type 14-EL Air Brake.
150 Ft. Two-Stage Air Compressor
Woodard Leading Trucks
Rushton Trailing Trucks
Detroit Flange Lubricators

The successful electrification of the World's first transcontinental railway is bound to lead the Pan-Pacific area to realize more rapidly its many opportunities for railway hydro-electrification

Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

San Francisco, 1 Montgomery St.
Los Angeles, 7th and Spring Sts.
Seattle, Second and Cherry Sts.
Portland, Broadway and Morrison Sts
Denver, 910 Fifteenth St.
Salt Lake City, Walker Bank Bldg.
Butte, Mont., 52 East Broadway

Westinghouse

UNIVERSAL

"The Trade Mark Known in Every Home"

ELECTRIC HOME NEEDS

UNIVERSAL Electric Iron No. E905
UNIVERSAL Electric Toaster No. E946
UNIVERSAL Electric Curling Iron No. E99011
UNIVERSAL Electric Coffee Urn Set No. E9166044
UNIVERSAL Electric Tourist's Iron No. E9021
UNIVERSAL Electric Vacuum Cleaner No. E701
UNIVERSAL Electric Immersion Heater No. E970
UNIVERSAL 3-Heat Electric Heating Pad No. E9940
UNIVERSAL Electric Grill No. E984

Convert Prospective Possibilities into Profit-Making Positives

IT'S all right to bank on the future but why not cash in on the present? The bird in hand is a good one—the Golden Pheasant of the **Present.** Selling Electric Appliances is a race of wares and wits. There is nothing in handling goods that are shining examples of lost motion.

WHEN you stock Universal Electric Appliances you are not paving the way to sales with stumbling blocks. You have a clean, smooth road ahead—as long and wide as you choose to make it.

BUYERS of Universal Appliances are never baffled adventurers. They know the goods—and only **good** of them. Every new buyer is an old customer in the making. Every first sale is a leader that has many followers.

"Universalize Your Home"

The Great Sales Accelerator

WITNESS the conspicuous "Universal" advertising in the leading magazines. It is making plain to housewives the advantages of using the complete line of "Universal" goods. This advertising is helping the dealer to plug in on new Circuits of Profit—turning prospective possibilities into profit-making positives. "Universalize your Store." Make it the fountain-head of supply—the ready, steady furnisher of the "Universalized Home."

SEE YOUR JOBBER TODAY

LANDERS, FRARY & CLARK

NEW BRITAIN, CONN

Hydro - Electric to a great West

More Power "D & W"

Pole Line Type

Subway Type
Showing Fuse Plug Removed
for Re-Fusing

"D & W" Oil Fuse Cut-Outs prevent arcs even from "dead short" circuits.

The instant a fuse blows in a "D & W" the oil is interposed between the terminals of the link. Exhaustive tests have been made under abnormally exacting conditions of large generator capacity and low power factor — and in every case the operation of "D & W" Oil Fuse Cut-Outs has been perfect.

Write for new Catalogue

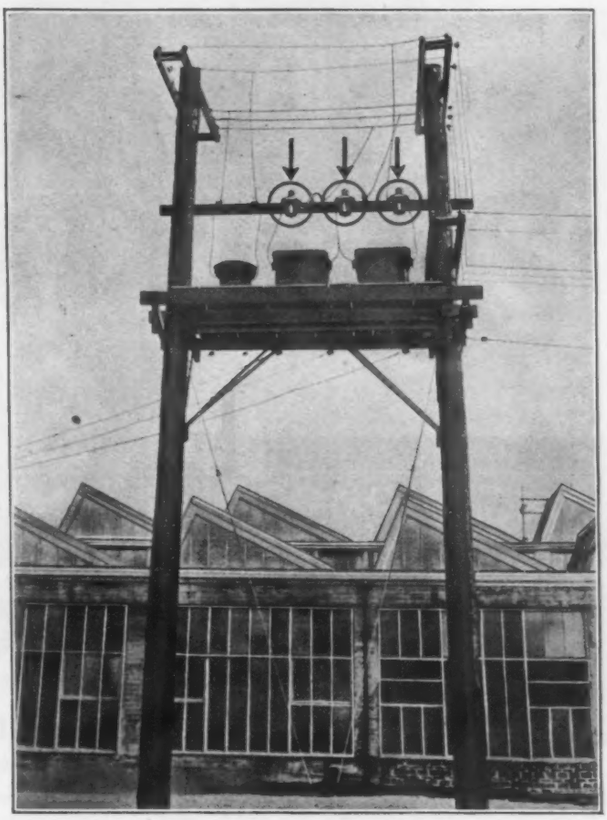
40,000,000 kw. water power holds the future of the West

Development—the key and a great Pan-Pacific

Means a Bigger Job for Guardians of the Line

And the important point is that no contact can be made until the Fuse Carrier is locked — a point that protects workmen and apparatus.

For Overhead Lines and Subway Systems. Hundreds of testimonials have come to us not only from the leading Central Stations of the United States and Canada but from the leading industrial plants as well, and the keynote of all is perfect protection.



Transformers on elevated platform at Kilbourne & Clark Mfg. Co., Wireless Factory, Seattle, Wash., protected by "D & W" Oil Fuse Cutouts

No. 2 giving Full Details

D & W FUSE COMPANY

of General Electric Co.

PROVIDENCE, RHODE ISLAND

The "B" assortment $50.00

Tell your foreign-born employees about

"Food Drafts"

HERBERT HOOVER, in a letter published in our editorial pages, urges engineers to explain the Food Draft System to their foreign-born employees and to interest them in its possibilities and value.

The American Relief Administration has on the press a quarter-sheet poster telling all about this, in all the essential foreign languages.

The 11 McGraw-Hill Publications strongly urge the cooperation of their readers in this most economical and practical method of supplying needed food to sufferers in Europe, and recommend sending for as many of these posters as you can use. Address American Relief Administration, 115 Broadway, New York. *They will be sent free of all charge.*

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All Capacities **— 0 to 600 amperes in both 250 and 600 volts bear the "Inspected" labels.**

—were the first line using an inexpensive bare link for restoring a blown fuse to its original efficiency to be *approved in all capacities* by the Underwriters' Laboratories.

When you order fuses insist on ECONOMY.

For sale by all leading electrical jobbers and dealers.

ECONOMY FUSE & MFG. CO.
CHICAGO, U. S. A.
Economy Fuses also are made in Canada at Montreal

IDEAS that co

Your labor for a lifetime is not equal to one labor-saving IDEA, applied in a factory of only a few hundred men.—

(O. C. Walton, Midwest Engine Company)

Bear this truth in mind when considering the labor-saving value of the

BISHOP CALCULA

A Workman's Invoice—When a workman begins a job or operation a time card is inserted into this machine. The plunger is then depressed which cuts a notch in the edge of the card.

When the job is finished the card is re-inserted in the machine and plunger is depressed as before. The time controlled mechanism is so arranged that the second notch always shows a direct reading of the elapsed time. **The noon hour and non-working periods are automatically subtracted.**

When the cards are sent to the office, a clerk whose duty it is to supply the correct

Bishop Calculating Recorders
Machine for Computing and Recording Elapsed Time

Mail us a post card today for our book "Simplifying Your Labor Costs." It will take but a moment to mail the card and about fifteen minutes to read the book—and for that investment of time we can promise you a lot of valuable cost keeping hints worth while even if you never see a Bishop. Of course, the book discusses the Bishop too. Mail the card today.

The only cost keeping
The elapsed time
reading in — DOLL

unt

The Wageometer

Suppose the rate of the worker in question is forty-one cents. The clerk slides the card along the guide until 41 shows at the top and $1.50 in the upper notch. He writes this on the card and the cost record is complete. Four and one-half seconds is a generous allowance for the complete cost card.

TING RECORDER

rate per hour for the workman, has on his desk one of our **wageometers** (illustration above). By simply placing the bottom of the card against the **stationary** guide rail he gets a **direct reading** of the **amount due** for the **elapsed time.**

It is accurate and rapid because the notch cut by the Recorder automatically locates the amount.

Instead of figuring and refiguring to prove correctness your cost clerk lays the card on the Wageometer and gets a direct reading of the amount due. Noon hours have been automatically subtracted when the card was punched—and the clerk gets his day's work done on time. With the Bishop, he can easily enter costs at the rate of about 800 an hour.

Write for complete information

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machine that records
and gives a direct
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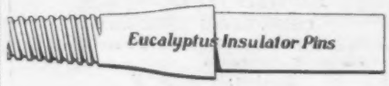

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Motors for individual drives for all branches of industry are included in the Crocker Wheeler productions.

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Learn what quality means in electric motor manufacture and why quality is economy.

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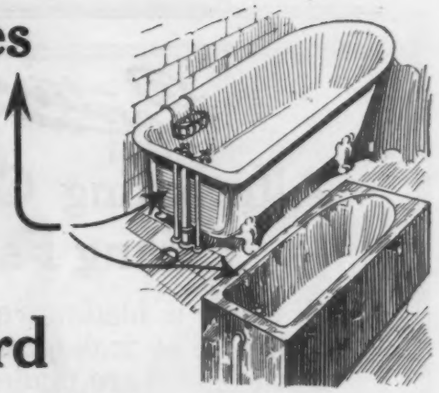
Think of the advantages of the "porcelain" (enamelled) tub over painted tin or copper. The vitreous enamel (used to envelope tubs, sinks and utensils) preserves the metal it envelopes against corrosion which would otherwise result from service conditions.



Ward Leonard Vitrohm Resistor Units and Plates

have their service element—the resistance wires—completely enveloped in vitreous enamel. There is no more chance for corrosion or destruction of the resistance wire than there is chance for the "porcelain" lined bath tub to rust.

Even the rapid changes in temperature to which the finer-than-hair wire (used in high ohms units) is subjected in service, do not destroy it. Heating and cooling cannot appreciably affect the resistance values—because the wires are hermetically sealed within the vitreous enamelled insulation. Ask for a sample Ward Leonard Vitrohm Resistor Unit.

ELECTRIC MATERIAL CO. Agt. for **Ward Leonard Electric Company** (Mount Vernon, New York)

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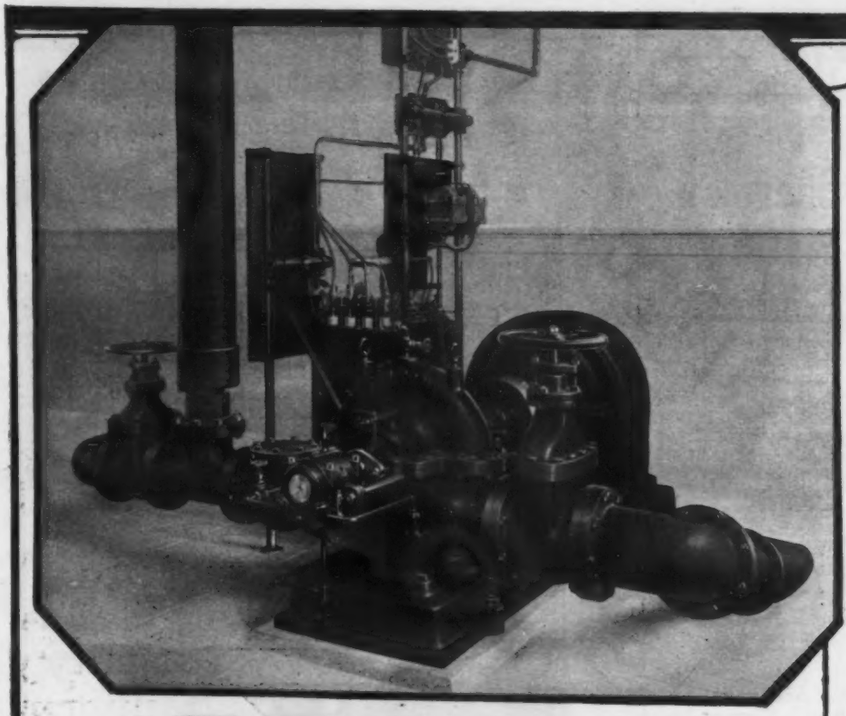

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are features inherently built into each PELTON Centrifugal Pump, regardless of whether it is a small pump for light house service, or a large capacity unit entrusted with the responsibility of supplying water for municipal fire protection. The same standard of materials and workmanship is combined in each type.

Contractors and construction men who take a just pride in their installations will find a pump well worthy of their consideration in the PELTON. It is a pump primarily intended to give thorough, continuous service and contains refinements of design and construction that are not found in pumps which have price only as their important feature.

Bulletin No. 10 contains illustrations and design specifications that indicate the quality of PELTON Pumps.

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Century

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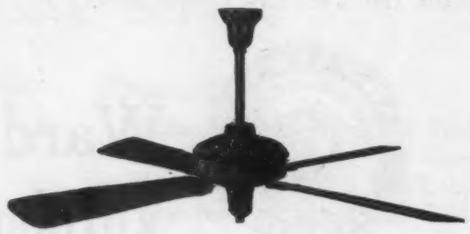
all have a blade sweep of 58 inches. The mahogany finished wood blades are made from selected kiln-dried stock, carefully weighed to preserve accurate balance.

Each fan is equipped with a two speed switch which provides for suitable speed variation.



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Sales Offices in Principal Cities

The 100% Electrician Says:

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"I can make connections in a jiffy with the

Sherman Fixture Connector

Sherman Fixture Connectors are all brass—assuring high conductivity. The screws can't come out—that saves time. They are simple—you can't get the wires in the wrong place. You need no acid, solder or blow torch—a tight connection is always assured.

Send for FREE sample of the Sherman Fixture Connector and try it. They are sold by all progressive jobbers.

When the manufacturer of Electric Fixtures equips his products with Sherman Fixture Connectors he improves his product and accommodates you. INSIST.

H. B. SHERMAN MFG. CO.
BATTLE CREEK MICHIGAN

They supply a great demand

They give splendid satisfaction

HEMCO TWINLITE PLUG

Ask your Dealer for them.

When you install any electrical appliance you will need a Twin Lite Plug. TWINLITE because it is compact and sturdy. It is made of molded Condensite and will stand usage that will shatter the ordinary plug.

There is a good profit for the dealer in stocking them—he can usually sell one or more with every appliance. They retail at $1.25 each or 3 for $3.50, are packed in attractive boxes and make a good display. Write to your jobber today for them.

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Pacific Coast Representatives:

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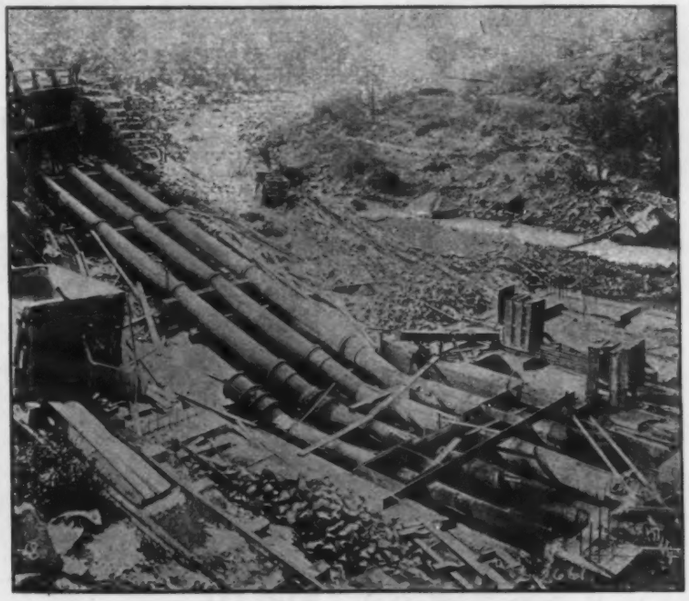
KELLOGG



If This Pipe Line

had to be replaced every few years or required a high rate of maintenance, would it be a profitable investment? That is the standpoint from which high head pressure pipe is purchased.

The unconditional guarantee that a pipe line will be durable, reliable and of 100% service continuously can be obtained in one make of pipe — KELLOGG.

Kellogg Pipe is built from the most suitable of materials — soft, resilient, low carbon steel. It is constructed to exactness by skilled workmen thoroughly experienced in pipe manufacture. It can be installed most satisfactorily.

Specify Kellogg Lap-Weld Pipe

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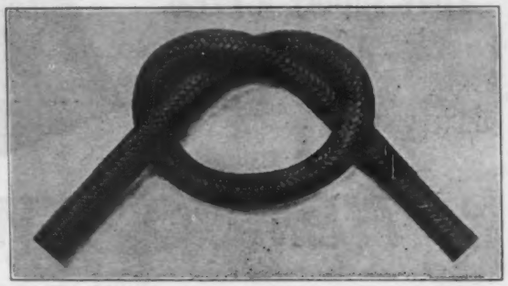

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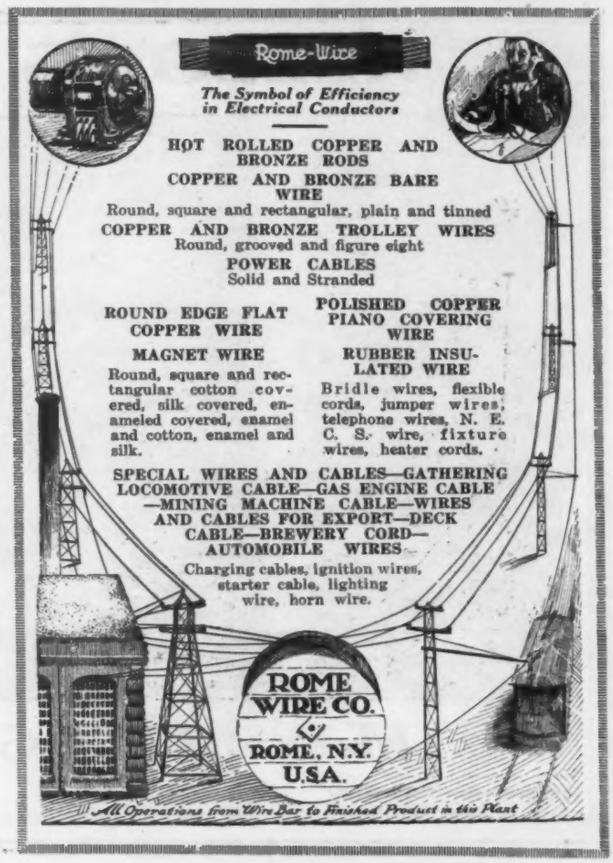
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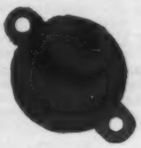

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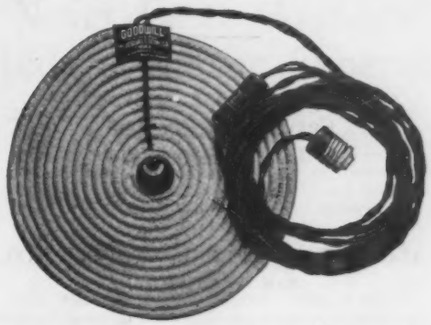

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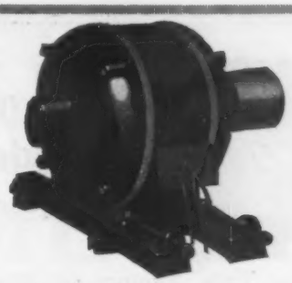

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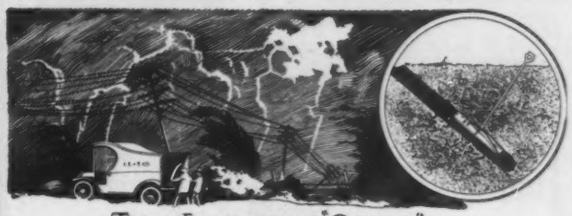

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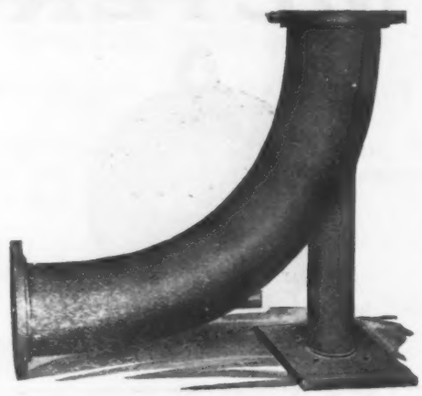

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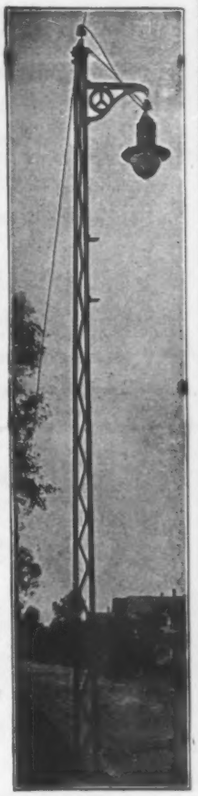

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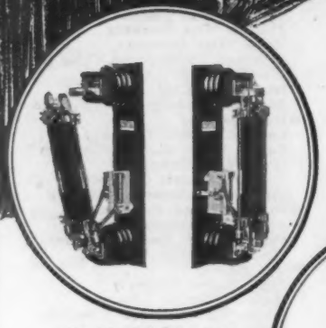
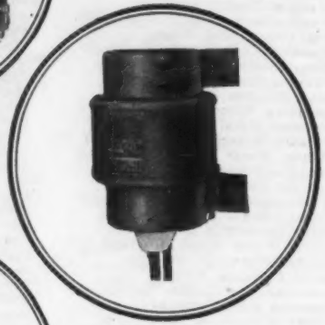


Combined Double-pole Fused Switch and Lightning Arrester



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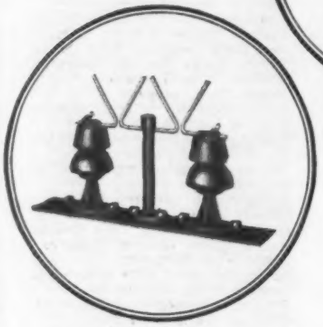

Double-pole Horn Gap

General Electric

General Office Schenectady, N.Y.

Company

Sales Offices in all large cities

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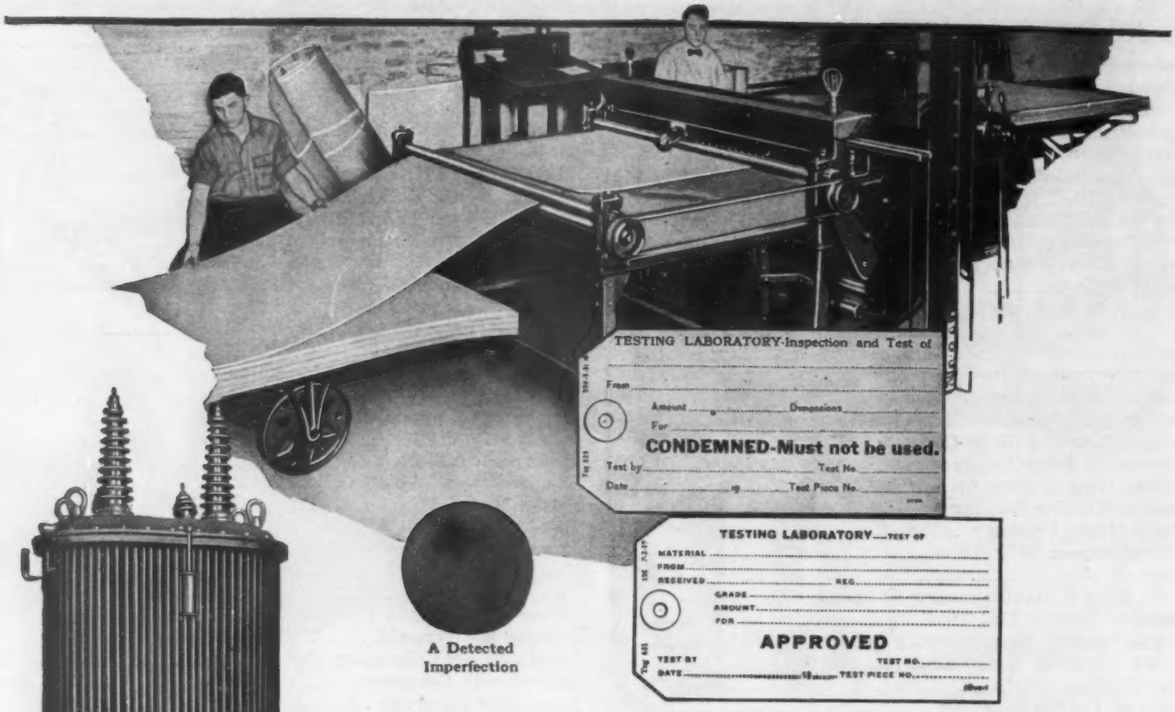
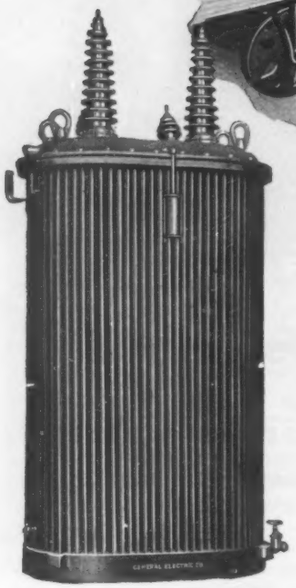
To forestall future trouble in service every care should be exercised when manufacturing a product to eliminate "first cause"



A Detected Imperfection



For Example

All pressboard used as insulation in G-E Transformers is subjected to a special high potential test, for the purpose of detecting any slight imperfection which may cause future trouble.

Every square inch of sheet insulation used, is passed between electric rolls and any invisible weakness existing is shown up. Whether in the form of a slight hole, crack, or bit of foreign substance, a breakdown occurs and the insulation is punctured.

Only perfect material is "Approved" for use—the imperfect pieces are marked "Condemned" and scrapped.

This small but essential detail is but one of the many precautions taken in the manufacture of

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The Standard of Quality

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General Office Schenectady, N.Y.

Sales Offices in all large cities

33A-25

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Apply for stock and sales helps to Pacific States Electric Company, Los Angeles, Oakland, Portland, San Francisco, Seattle and Spokane

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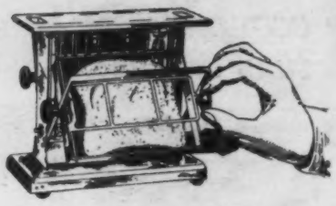
Manning-Bowman Quality

is always to be found in the purchase of this electrical equipment.

Goods you can recommend



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